SCIENTIFIC AMERICAN

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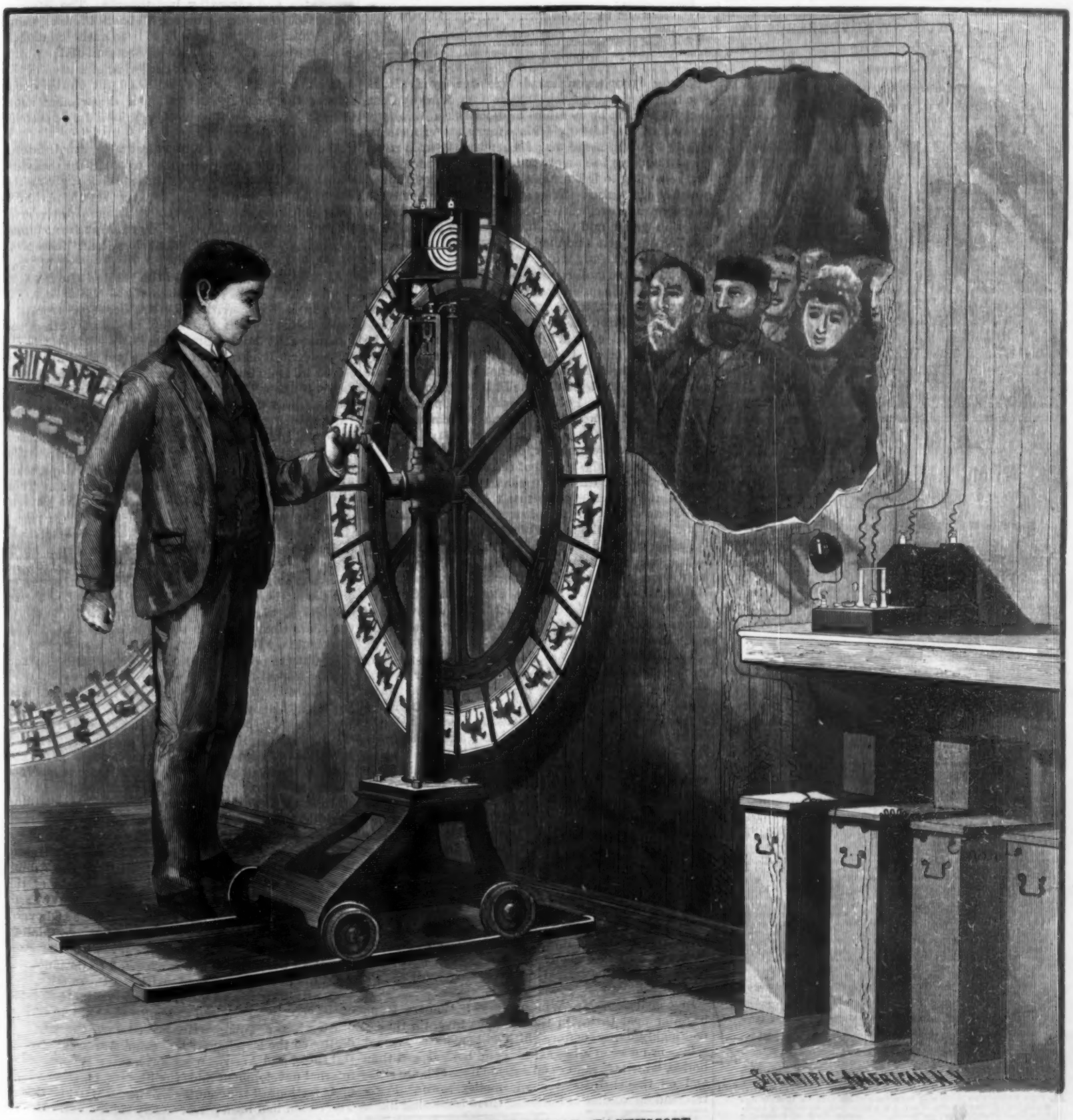
THE ELECTRIC TACHYSCOPE.

Moving objects when viewed by an instantaneous flash of light appear stationary. Examples of this phenomenon may be seen during every thunder storm occurring at night. The wheels of a carriage, a moving animal, or any moving object seen by the light of the lightning appears perfectly stationary. The duration of the light flash in these cases is so brief as to admit of only an inappreciable movement of the object while the illumination lasts. If a moving object is viewed during a succession of light flashes, it will be seen in as many different positions as there are flashes. The stroboscope or zoetrope is based upon this principle, and depends further for its effectiveness upon the persistence of vision. As is well known, these instruments show a succession of images in different positions which are blended in the eye into one continuous image having the appearance of constant movement.

Up to the time when photography arrived at that perfection which would permit of taking an impression in a very small fraction of a second, the stroboscopic or zoetropic pictures were produced by drawing and engraving, and were very crude. The exceedingly sensitive plates have rendered it possible to take a succession of images of moving objects which could be blended together by a stroboscopic action so as to produce all the appearance of life and action.

We have recently on several occasions published the results of experiments of this kind made in our own country. We have now to present some examples of the same class of work produced by Mr. Ottamar Anschuetz, of Lissa, Prussia. This artist has been very successful in taking instantaneous pictures of flying birds, running horses, jumping men, etc., all of which compare favorably with pictures taken under more advantageous conditions. These fine results are due principally to the artistic tact and scientific skill of the operator, but the camera with which these pictures have been taken is an important factor. The principal feature of the camera is its shutter, which is arranged immediately in front of the sensitive plate. It consists of a curtain having a narrow slit which is as long as the plate, the width of the slot being made variable to adapt it to different conditions. This slitted curtain passes quickly over the face of the sensitive plate, exposing successive portions of the sensitive surface to the action of the light. By virtue of this ar-

(*Continued on page* 310.)



ANSCHUETZ'S ELECTRICAL TACHYSCOPE.

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(Illustrated articles are marked with an asterisk.)

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For the Week Ending November 16, 1889.

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AN IMPORTANT INVENTION WANTED.

At the recent meeting of the American Street Railway Association, Minneapolis, several interesting papers were read and discussions took place concerning the use of mechanical motors for street car propulsion. The desire is almost universal among the car people to get rid of horses, and they are not only ready but anxious to adopt anything of a practical nature that can be invented. Electricity appears at present to be the most available substitute for horse flesh, and a number of parties who work electrical roads spoke well of the system and claimed for it economic advantages over horse power. But it was fully conceded electricity was attended with serious difficulties, and the feeling seemed to be it should be got rid of the moment anything better presented itself. The general testimony was that cable propulsion was at present the most satisfactory of any of the systems in use; but its great first cost was a serious obstacle, to say nothing of the troubles that attend its ordinary operation.

As between cable cars and electrical plants the following figures were given:

Cost of cable construction	$700,000
Cost of power plant	125,000
Cost of car	15,000
	$840,000
Electrical overhead wire construction:	
Cost of road bed	$70,000
Cost of wiring	30,000
Cost of cars	60,000
Cost of power plant	30,000
	$190,000
Storage battery:	
Cost of road bed	$70,000
Cost of cars	75,000
Cost of power plant	30,000
	$175,000

Among other reports made was one by Mr. H. H. Windsor, Secretary of the Chicago City Railway Company,* in which he mentions or describes a variety of car motors, which he divides into four classes: 1, steam; 2, gas; 3, compressed air; 4, chemical. Steam street car motors have been more or less used for many years; but, according to this author, the best of them fail in essential particulars. They are heavy, tear the track to pieces, more expensive than horses, dangerous to life, soon grind and wear themselves to pieces. The peculiar dust, grit, and mud of cities soon takes away the life and ruins any motor with exposed machinery.

Steam storage motors have been considerably tried, according to this reporter; but so far have sadly failed. They are weighty, constantly getting out of order, and give no end of trouble.

Gas-propelled cars are hopefully spoken of. The Connelly gas motor is said to have been successfully tried at Elizabeth, N. J.; but is not yet ready for submission to critical tests. The Patton gas motor, now being built at the Pullman works, has peculiar features. It is to run continuously on the car to drive a dynamo which is used to charge a storage battery, which is to drive another dynamo, which, through gears, is to drive the wheels of the car.

Compressed air cars and pneumatic tubes are mentioned, and various experiments therewith are described. None of the air plans has proved really available thus far to stand the racket of street car work.

Under the head of chemical motors, the nitrate of soda motor, which is really a heat storage system, is mentioned. It was tried in Chicago in 1886 and failed. McLaughlin's chemical motor, at Omaha, yielded no permanent practical results. McMahon's revival of the ammonia gas engine at New Orleans, three years ago, came to naught.

The author describes as follows a curious freak of mechanics which has been lately on trial for several days on one of the Chicago City Railway Company's lines. "The motor consists of an eight-foot flat car, a vertical boiler on one end, an engine that looks like a churn laid on its side, and about the size of a churn, with the handle sticking out and turning a gear wheel which meshes with a cog on the car wheel axle. There is no noise, the engine reverses in a fraction of a second, and quickly attained a speed of 13 miles per hour on level track. It made a half mile run up a heavy grade in three minutes. This engine is something entirely new in mechanics, the Patent Office recording that nothing like it is of record. It is an economical user of steam, is noiseless, takes no room, has no parts visible, and but few inside, is very cheap, and very powerful. One the size of an ordinary butter churn would develop 15 or 20 horse power with 60 pounds steam. We have great hopes of it, and it can be steamed from oil fuel, will be less difficult to operate than a team of horses, and can be carried on a passenger car or in a motor car."

In conclusion, Mr. Windsor says: "There is no brighter field to-day to the studious inventor than a reasonably cheap motor, which will operate without smoke or noise, at a less expense and better speed than horses, which we can use on outside lines of large cities and on the entire system of smaller towns. For a tremendous volume of business, there is nothing like a cable, and electricity is making strong claims for its place, but there are thousands of miles of car track in this country which are waiting for a practical and economical motor. And the really practical man, who invents a really thoroughly practical machine, will be welcomed in a way that will place him beyond the confines of the poorhouse. Let us then watch and study and hope, and live in the expectation that ere another year rolls round, and gathers us once more around these topics, the question may be in at least a fair way to solution, and our bondage to animal power and its bondage to our work be a thing of the past."

* The report in full is given in this week's SCIENTIFIC AMERICAN SUPPLEMENT, No. 724.

THE NATIONAL MARITIME EXHIBITION.

This admirable project was organized and is now being directed with the single purpose of assisting to reestablish our old time supremacy upon the ocean. The exhibition is in Mechanics' Hall, which at last week's opening was profusely decorated with the national colors and the insignia of the naval and merchant fleets. There are seven acres of space, all filled with interesting exhibits; models of the Old Ironsides and many of the most famous Yankee war ships, showing the various changes in construction, and including models of the new steel cruisers. There is an extremely interesting exhibit of the fisheries marine, including a model of a "banker" and her outfit of trawls, lines, dories, and holding gear. The lighthouse service shows models of light towers, beacons, bug lights, and the various description of buoys. The hydrographic office of the navy exhibits charts, deep sea sounding apparatus, and surveying instruments. The life-saving service shows new mortars, lifeboats, lifelines, belts, etc. From the ship yards have been gathered models of ships, steamers, yachts, steam electrical and naphtha launches, with a comparative showing of models of the famous transatlantic greyhounds built on the other side of the ocean. The ordnance department show the various calibers of marine guns, including a secondary battery of quick-fire guns.

A canal 565 feet long and 12 feet wide, quadrilateral in shape, with plenty of water to float the heaviest models, is a unique feature of the exhibition, giving the visitor an opportunity to study the set and action of great ships by observing their floating counterparts. There is also a complete showing of ship's furnishings, capstans, steering gear, patent logs, lead lines, compasses, etc.

At the opening ceremonies the band of the Seventh Regiment, N. G. S. N. Y., played the "Maritime Exhibition March," written for the occasion, from the main deck of yacht Quickstep, the handiwork of the famous yacht builder Burgess.

President Ryckman, in opening the exhibition, declared its main object to "inculcate economical truths and encourage that which will lead to the rebuilding of American shipping." Hon. N. D. Sperry, of New Haven, who came next, felicitated the assemblage and the country on the successful opening of an exhibition which would be a national educator and an inspiration to ocean trade. He hoped to see Yankee ships, manned by natives, showing our ensign on every sea. This, he thought, would surely follow if only the government lent its assistance.

The Rev. Phillips Brooks, in offering prayer, made its burden a hope that the seas would be given up to peaceful merchantmen, and that there would be no more war ships; thus inclining to the opposite view of our necessities as expressed by the projectors of the exhibition, who hold that war ships, and plenty of them, are what we are just now in pressing need of, as a preliminary to the organization of a merchant fleet; their duty to protect the same, to show the flag and enforce respect for it.

Sailors from the fleet sang a new national anthem, and then the speaking recommenced. Mayor Hart, of Boston, said he believed that what was needed to make this nation the greatest was that government encouragement and protection which the sailors and shipbuilders of other nations receive. Lieutenant-Governor Brackett said in effect:

Shipping was in the seventeenth century the leading pursuit of Bostonians, the city having more ships than Ireland and Scotland combined. It is a source of regret that this industry has declined. It is the sincere hope of all that it may soon be revived. The exhibition comes simultaneously with the demand of the State for the reopening of the Charlestown Navy Yard, which has constructed many famous vessels and ought to be reopened. It is also a source of congratulation that the exhibition is contemporary with the Pan-American Congress, which is expected to do much toward the promotion of trade with South America.

The Hon. Orlando Potter, of New York, the orator of the occasion, reviewed at length the rise and decline of American shipping. He showed how the war had destroyed the merchant fleet, commerce seeking neutral ships, and American capital leaving the ocean for internal development and the binding together of remote sections of the country by the great trunk roads. The Union had been preserved by this course. It was time to regain our ocean commerce. There could be no navy worthy the name without training ships of a

merchant marine. The key to the situation rests with Congress. There is no other power by which the restoration can be secured. A greater responsibility rests on the coming Congress in this respect than was ever placed on any other, and if its action and that of its successors be in accordance with the policy of the past, our foreign commerce will in ten years be not only dead, but buried. The speaker closed with an elaborate argument in favor of subsidies to American ships.

THE PURITY OF THE NEW WATER SUPPLY FOR NEW YORK.

Under the direction of the State Board of Health there is a complete analysis of the Croton water made each week. Taken for a year the results confirm the belief that the water contains more foreign matter in summer than in winter. This periodic variation is specially noticeable in the presence of free and albumenoid ammonia, which are recognized to be among the more dangerous elements of pollution.

To display the variation in the amounts of these impurities we will separate the year into three terms of four months each, commencing with January, and give the average of the results for the respective terms in grains per gallon :

	Jan.-April.	May-Aug.	Sept.-Dec.
Free ammonia	0·0001	0·0047	0·0008
Albumenoid ammonia	0·0226	0·0282	0·0041

Free ammonia is highest in the May-August term, when it is 4·7 times greater than in the first term; albumenoid ammonia is highest in the September-December term, being then double what it is in the balance of the year. Thus it will be seen that the excess of these particular forms occurs in the eight months following April. A comparison between the averages for the calendar months shows that free ammonia reaches its maximum in July (0·0009 grain) and albumenoid ammonia in September (0·0056 grain).

So far as domestic use is concerned we would declare any water supply to be objectionable that was impure one month out of the twelve. Up to the present time we believe the Croton water to have proved itself wholesome throughout the year, and consequently we may conclude that the impurities named are not present in sufficient quantity to cause sickness.

The value of the information gained from these analyses would seem to depend upon what they forecast. It is certainly of little value to the people of New York to be assured by the State Board of Health that they are not at present sick. Evidently what the people want to know is, When will the Croton water contain enough ammonia or other deleterious matter to create general sickness? This question is not so frivolous as at first might appear, for the city is just on the eve of gathering and drawing a much greater volume of water, and hence the importance of inquiring whether the increase of supply is going to diminish or increase the pollution.

It is among the pretensions of the scheme to claim good quality for the additional supply, but where is the proof of it? So it was a pretension of the scheme to afford *three* or *four* hundred million gallons daily, but now it is clear that the volume available is only *two hundred and fifty* million gallons. Likewise it was a claim for preference that the scheme would provide a gravitation supply, but now it is clear that *three-quarters* of the delivery will have to be pumped by the consumers. May there not be as much guesswork about the quality as there is about the quantity and pressure?

To increase the present supply from 100 million to 250 million gallons daily, it will be necessary to increase the storage from 9,000 to 43,000 million gallons, showing that the additional delivery of 150 million gallons daily requires 34,000 million gallons storage, and consequently, while the ratio of storage to draught in the first instance is *ninety to one*, in the second it is *two hundred and twenty-five to one*.

We have seen from the weekly analyses that the season of high percentages is coincident with the season of maximum evaporation, which must also be the term when the reservoirs are least replenished by rainfall; in other words, the content of ammonia reaches its maximum at the time when storage exerts its worst effects. Now, if the excess of impurities is attributed to the storage, it is plain that the injurious influence will correspond to the extent and duration of storage, and accordingly the percentage of pollution will be greater when the draught is 250 than when it is 100 million gallons.

In the recent report of the State Board of Health, we find nothing said about the condition of the Croton water when the city is taking *five-sixths* of the flow-off instead of *one-third* of it. If the question is a speculative one, and a professional opinion is of no value, then the people are running great risk in pursuing the project farther; but on the other hand, if the quantity of pollution already ascertained to be present at all approximates the point where it will render the water unwholesome, then the report avoids the real object of the investigation.

The Spanish Language.

BY E. OGIER.

The Spanish language is derived from the Latin. It has preserved none of the various indigenous forms of language; of all the Latin tongues it is the purest, for it has taken nothing from the barbarian conquerors who overran Spain; and in spite of several centuries of foreign occupation, only a few foreign words have retained a place in the language; it is homogeneous. Much more Latin than Italian is, it does not disfigure its words either by elisions more or less arbitrary or by illogical constructions, and its syntax is strictly laid down; it does not easily lend itself to the caprices of fashion or the whims of authors; it still remains what the sixteenth century authors made it.

Even in the middle ages the language of poetry was already formed, and required only the necessary lapse of time to polish it. Spanish literature flourished from that period, and Cervantes found ready to his hand the marvelous instrument which was to create the first masterpiece of really European literature.

The most singular feature of the Spanish language is its capability of being a perfect instrument at once for prose and poetry. In this respect it surpasses all others; Greek alone can be compared to it. As if this marvelous language were destined to be perfect in every way, it is as well adapted to the portrayal of the most vigorous passions as to that of the tenderest sentiments.

In prose, as in verse, the language shapes the idea, and, as it were, carves and moulds it. The great poet Villegas had already, in 1500, adapted it to every variety of Greek rhythm and meter. Ercilla, one of the conquistadores, about the same time, wrote his epic poem "Araucana," in language as delicate and flexible as his own sword. Quiros, and Cervantes himself, drew poetical arabesques which throw the modern romantic school into the shade.

But let us leave these highly educated authors, distinguished Latinists, Hebraists, and Hellenists, and let us seek the fountain head, the unknown, popular, simple, uneducated authors, the romanceros (ballad singers).

In those times—more glorious, perhaps, than we think—whether war were carried on against Goth or Vandal, Saracen or King, the romanceros sang of everything—a romance of religion or love, a rustic song, a heroic deed, a ballad, civil or political history, celebrated paladins, noble ladies, provincial rights, liberty, famous palfreys, the Cid Ruy Diaz de Bivar and Ximena, Ogier and Durandarte. A fine and copious stream of poetry, drawn from the very fountain head—the heart, the head, and the arm. What sap! what vigor!

History may break off, monks may impose silence, but history will live on in ballads—true national history. The progress of civilization, exalted faith, *fueros* (charters), gallantry, chronology, sieges, dynasties, marches and provinces, bishops and clergy, civil rights and canon laws, political life—all these the ballad treats of, and the language allows of it. Without a settled language, it would have been impossible. We may judge of the glorious artists Spain possessed in those days when she outshone all Europe by the works they have bequeathed to us.

After the resplendent talents and literary genius of the fifteenth and sixteenth centuries came, alas! the wretched, passionless classicists; conventional poetry, more varied, more regular, assimilated the literature of Spain to her kings, swathed in etiquette, stiffened in ceremonial. It no longer attracts by its national vigor; poetical originality fades away; authors seek rather to imitate, to draw from Greek and Latin sources; impotent rules of poetic art can only supply lifeless forms, as is always the case where inspiration is wanting; art vainly seeks to support talent. All the works of these authors of the decadence have been preserved, and are still admired. Why? The language has saved them; it has given a body to the feeble idea, like those preparations which give substance and firmness to vaporous gauze.

Essentially poetic in character, being essentially dreamy and contemplative, the Spaniard still preserves his ancient gravity, and his language is the most solemn as well as the most poetical in Europe. It sings in a serious manner the subject which inspires it, and this seriousness adds to its grace. Strength, grace, and dignity are the principal characteristics which render it a language worthy to be spoken by the gods.

[To the foregoing eloquent tribute to the literary merit and importance of the Spanish language we may add the more prosaic yet to American students and business men the more suggestive remark that the Spanish tongue competes with the English for the mastery of the New World. With the exception of Brazil and the Guianas, the language of the South American states is Spanish. It is also the dominant language of the West Indies, Central America, and Mexico. These are our neighbors, and they furnish the nearest market for our surplus goods, as well as the sources of many of our importations. Railway communication with Mexico is accomplished, and the building of 2,000 miles more will complete the iron highway between our country and all the South American republics. Every year draws the commercial ties between us more and more close, and every year makes a knowledge of Spanish speech more and more valuable to our manufacturers and merchants. During the coming winter evenings our young people will do well not to neglect the pleasures and profits of Spanish in choosing their studies.—ED.]

New Design for a Ship Railway.

A considerable amount of interest was taken in a recent lecture on his ship railway by Mr. William Smith, at the rooms of the London Chamber of Commerce. Engineers have always started with the assumption that it is necessary to build a perfectly straight and level road for a ship railway, if not for the whole length, at least for sections, for otherwise the safety of the rigid ship is not provided for. Following out this theory, Captain Eads proposed floating pontoons at the ends of the sections on his Tehuantepec line, for altering the level and direction, these pontoons acting in the manner of turntables on an ordinary railway, and also in a vertical plane. Besides the difficulty of dividing the line as mentioned, there would be at these junctions loss of time and momentum. Mr. Smith has, however, set himself the task of finding a means for conveying a ship from one coast to another along easy changes of gradient and around curves.

The inventor does not claim anything novel in the trucks which he uses. The new departure consists of hydraulic cushions, which are simply watertight bags girthing the ship from end to end, and resting as a cradle or series of buffers between the car body and the surface of the hull. These bags, when placed in position, and filled with water, and opened at the tops, serve as a medium in which the vessel can ride exactly as in a calm sea. As the wheel base turns in its travel, or ascends and descends, the ship does not feel any ill effects. The cars are built in segments hinged together, and thus allow for a free vertical movement, while the several bogies, being connected at their extremities and with a single center pin to the car itself, permit of full lateral variations. Very little water is said to be necessary for the bags, and if the line proposed were quite straight, the thickness of the bags need only be very thin.

Arkansas Antimony.

A very remarkable deposit of the ores of antimony has been found, and a plant is being rapidly prepared for smelting this metal, in Levier County, Arkansas, and it has especial interest to us from the fact that it is the first to promise a valuable quantity in this country, and is in the hands of Philadelphians. The Levier County mineral region has discovered a great capacity for valuable mines. It is the southwestern extension of the Iron Mountain, and all through the hills and uplifts there are veins of argentiferous galena, copper, cobalt, nickel, manganese, and antimony, as well as some gold. In the present case there have been a number of veins of pure sulphide of antimony opened, varying from six to twenty inches in thickness, and of increasing width as far as proved, to the depth of 200 feet or more. The mineralization is unprecedentedly pure and free from the usual associates of other materials, although there are mixtures with galena, quartz, etc., and also some carrying silver.

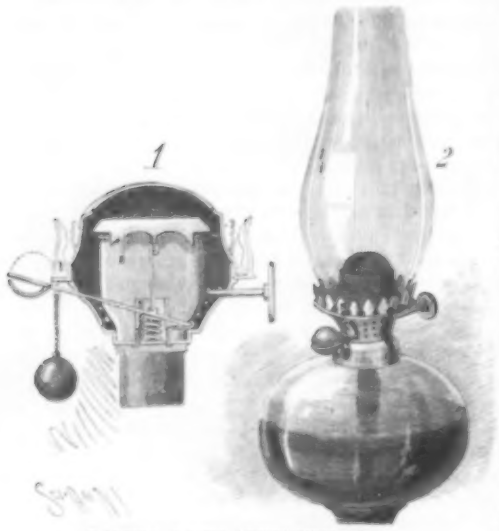
The company formed to open and work these veins has secured a large tract of land along the outcrop of the veins, and has made a large number of pits, and raised hundreds of tons of the ore. Smelting furnaces are being erected to make the reduction at the mines, near which the town of Antimony City has been laid out, with a cluster of initial residents. This mineral sulphide is technically known as *stibnite*, and is composed of 72 per cent of metallic antimony, 27 per cent of sulphur, and small proportions of copper, lead, silver, iron, and silica. In some cases the *stibnite* is pure, without admixture of other metals.—*Iron*.

Possibilities of the Phonograph.

Edward Bellamy, the author of "Looking Backward," has just written a fanciful sketch entitled, "With the Eyes Shut," in which he describes an approaching phonographic age. The uses which are found for the phonograph are novel and amusing. Passengers on the railway trains are supplied with phonographic literature so that their eyes are not injured by reading in a jolting coach. The names of the stations are announced by phonograph in clear tones which form a striking contrast to the incomprehensible gibberish of the ordinary brakeman. Mr. Bellamy describes a night's experience in a hotel. He was startled from his dreams by the sound of a voice. He continues: "What had startled me was the voice of a young woman who could not have been standing more than ten feet from my bed. If the tones of her voice were any guide she was not only a young woman but a very charming one. 'My dear sir,' she had said, 'you may possibly be interested in knowing that it now wants just a quarter of three.'" His terror vanished when he discovered that the voice issued from a clock which was equipped with a phonographic announcing apparatus.

AN IMPROVED LAMP EXTINGUISHER.

A device designed to automatically extinguish the flame of a lighted lamp should it be accidentally overturned is illustrated herewith, and has been patented by Mr. James H. Paige, Fig. 1 being a sectional view illustrating the application of the device, and Fig. 2 a view in perspective of a lamp provided with this improvement. Fitted about the upper end of the wick tube is a wire with two ends bent outwardly to serve as pivotal supports for a metal cap, adapted to be swung over the wick to extinguish the flame. A finger on the cap limits its backward movement, and pivotally attached to a lug projecting centrally from the



PAIGE'S LAMP EXTINGUISHER.

cap is a rod connected at its other end to a lever pivoted at one side, with its other end extending through a slot in the other side of the tube chamber. The outer end of the lever is bent into circular form to constitute a rest or receptacle for a weighted ball, which may be connected by a chain to a convenient part of the lamp. At one side of the pivotal point of the lever is fixed a tube serving as a housing for a spring designed to force the lever upwardly when the weighted ball is not in the receptacle, as illustrated in Fig. 1, thereby forcing the cap over the wick to extinguish the flame. When the weighted ball is in the receptacle, as shown in Fig. 2, it is designed that the force of the spring shall be overcome by the weight, and the cap will then be held in a raised position away from the wick, but any undue jarring or tilting throws the weight out and allows the spring to operate. To extinguish the lamp, instead of blowing down the chimney, it is simply necessary to raise the end of the weighted lever with the finger, allowing it immediately to drop back to the normal position. It is suggested that this improvement might be advantageously employed with lamps on railroad cars, in which case the jar caused by a heavy collision would displace the weight, and the lamp would then at once be automatically extinguished.

For further particulars with reference to this invention address Mr. J. H. Stotesbury, President of the Paige Lamp Extinguisher Company, Leadville, Col.

AN IMPROVED DOUGH MIXER AND KNEADER.

A device designed to preclude the necessity of putting the hands into the dough in the process of mixing

STONE'S DOUGH MIXER AND KNEADER.

and kneading, and efficiently knead the dough with the least expenditure of strength, is illustrated herewith, and has been patented by Mr. D. G. Stone, of Negaunee, Mich. A horizontal frame is provided with a central vertical stud, and to one end of the frame is secured a vertical frame in which is mounted a block supported by trunnions, the block being apertured to receive another block supported by trunnions riding in bearings formed in the first block. Upon the horizontal frame is placed a circular table, having a central aperture to receive the vertical stud, upon which the table is free to turn, and which table, being removable, is used later as a bread board in the process of shaping loaves for the oven. To one side of the table is secured a hook adapted to engage one edge of the pan, and the opposing edge of the table has another hook, provided with a turnbuckle, by means of which the pan may be secured in place on the table. The combined mixer and kneader is supported by a lever having a handle at one end and a projection at the other end adapted to enter the central block in the vertical frame, the face of the mixer, which is shown in use in the illustration, being concavo-convex in cross section, while the kneader end of the implement is preferably formed with a groove. The proper ingredients having been placed in the pan, the mixing is effected by reciprocating and turning the lever, revolving the table as desired, as the work proceeds, and when the kneading is to be done the lever is simply turned to bring the kneader into operative position, when the operation may be carried on continuously. The ease with which this usually tiresome labor may be performed by means of this device is designed to insure more thorough kneading, and thus the making of bread more uniformly light and porous.

For further information relative to this invention address the inventor as above.

Effects of Alcohol on the Mind.

It is one of the curious errors that alcohol stimulates the imagination, and gives a clearer, more practical insight into the relation of events of life. The whirl of thought roused up by the increased circulation of the blood in the brain is not imagination; it is not a superior insight or conception of the relation of events, but is a rapid reproduction of previous thoughts, soon merging into confusion. The inebriate never creates any new ideas or new views; all his fancies are tumultuous, blurred, and barren. The apparent brilliancy is only the flash of mania, quickly followed by dementia. Alcohol always lowers the brain capacity, and lowers the power of discriminating the relation of ideas and events. After a few periods of intoxication, the mind under the influence of spirits is a blank, blurred page. The poets and orators who are popularly supposed to make great efforts under the influence of alcohol only repeated what had been said before in a tangled delirium of expression. The physicians who are supposed to have greater skill when using spirits have paralyzed their higher brain centers, and have lost all sense of fear or appreciation of the consequences of their acts, and hence act more automatically, simply doing what they have done before without any clear appreciation or discrimination of the results. The inebriate is the best of all imaginative persons, and the one in whom the higher brain forces of judgment, reason, and conception are the first to give way. The man who uses spirits to give mental force and clearness is doing the very worst thing possible to destroy this effect. Alcohol is ever and always a paralyzant. It never creates anything; it never gives strength or force that did not exist before; it never gives a clearer conception and power of execution, but always lowers, destroys, and breaks down.—*T. D. Crothers, M.D.*

Be Explicit in Making Bargains.

It is evident that many law suits and unpleasant business differences, and considerable loss of money, could be avoided by explicitness in asking and giving prices, in ordering, and in making statements, either oral or written, regarding the details of transactions. Kicks and complaints are very common in the lumber business, says the *Lumberman*, and it applies equally to business transactions of every kind. Trouble arises from misunderstandings that might easily have been averted by carefulness at the outset of a deal, while in other instances definiteness of statement on the part of buyer or seller, in event of controversy, would have made plain the merits of a case that looks decidedly mixed because too much has been taken for granted. Inquiries often reach the *Lumberman* office regarding the right or wrong of a disputed point involving a rule or custom, but as a general thing a decision cannot be made without going into details that the inquirer omits to furnish. An ambiguous order should never be given, nor should goods be forwarded on the strength of it. If there is any opening for a mistake as to the dimensions or quality of stuff that is ordered, all the points should be definitely stated. Orders by telegraph especially are often too brief, are open to misconstruction, or lacking in detail. If goods are so urgently wanted that they are telegraphed for, it is certainly highly important that there should be nothing wrong on their arrival. The great aim of most persons in writing out a message is to save a few cents by boiling it down—an economy that often loses dollars for the sender. An order by telegram should be made to state exactly what is wanted, no matter how many words are required, and then in case of a dispute the buyer will have more ground to stand on.

The Forth Bridge Nearly Completed.

The directors of the Forth Bridge Railway Company recently visited the bridge by the aid of a gangway over the gap at the north girder, and walked on the bridge from the south to the north shore of the Forth.

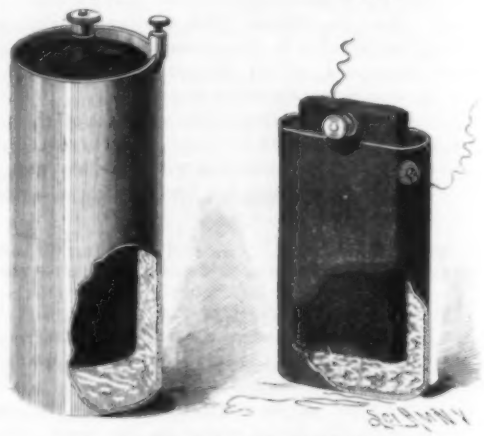
DRY BATTERY.*

Dr. Carl Gassner's patent dry battery is much the same in principle as the Leclanche, but the exciting fluid is contained in a paste, and the zinc element forms the containing vessel. Two forms of the battery are made, one being cylindrical, as shown in Fig. 1, the other elliptical, as shown in Fig. 2.

The carbon rod or plate occupies about one-half of the space in the cell, and the space between the carbon and the cell is filled with the following mixture:

"Oxide of zinc, 1 part, by weight; sal-ammoniac, 1 part, by weight; plaster, 3 parts, by weight; chloride of zinc, 1 part, by weight; water, 2 parts, by weight. The oxide of zinc in this composition loosens and makes it porous, and the greater porosity thus obtained facilitates the interchange of the gases and

Fig. 1. Fig. 2.



DR. GASSNER'S DRY BATTERY.

diminishes the tendency to the polarization of the electrodes."

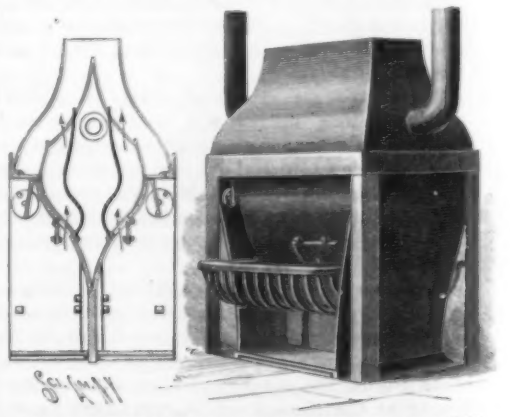
The battery works well on an open circuit, and is cleanly and portable.

Removing Paint from Painted Surfaces.

Four pounds of Irish moss, 3 pounds of methylated spirit, and 3 pounds of fuller's earth are mixed with 30 pounds of water, the whole boiled, and a solution of 16 pounds of caustic soda and 16 pounds of caustic potash dissolved in 28 pounds of water added, after which the product is stirred until it is cold and has solidified to a brownish gelatinous mass. The proportions of the ingredients may be varied. The compound is used by applying it to the painted surface with a brush, allowing it to remain thus for twenty minutes to one hour, and then washing it off together with the paint that has been disintegrated by its action.

AN IMPROVED FIREPLACE AND HEATER.

A fireplace designed also to serve the purpose of a heater, whereby the upper rooms of a dwelling may be warmed, is shown in the accompanying illustration, and forms the subject of a patent issued to Messrs. Joseph S. Cloud and Samuel D. Dearman, of Spartanburg, S. C. Our view shows the improvement applied to form a double fireplace in a partition between two rooms, when either one or both of them may be used as desired. Curved back plates and side plates are employed to form a chamber to the back of and over the



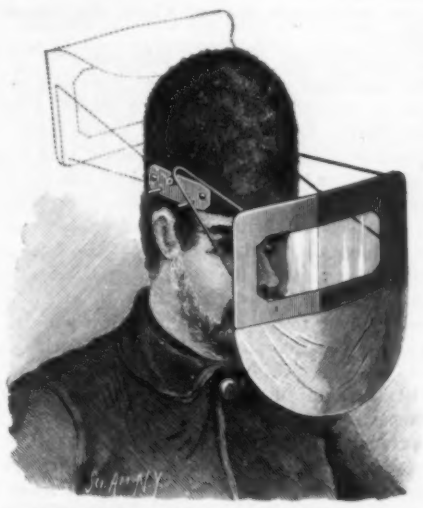
CLOUD & DEARMAN'S FIREPLACE AND HEATER.

fire, above which is a dome connecting with the chimney flue, the throats at the edge of the dome having dampers. Resting upon and between the curved backs is a central hot air chamber, from which the air is taken by pipes to heat upper rooms, this chamber also having flues through which the smoke and products of combustion pass, as shown by the arrows in the sectional view, when the dampers at the edge of the dome are closed, and other dampers situated low down and centrally in the back plate are opened. Wide rods or flanges at the back of the fireplaces hold the fuel away from the curved plates to form space for air to pass up back of the fuel to the lower dampers.

* From "Experimental Science," by George M. Hopkins. Munn & Co. publishers, New York.

IMPROVED SHIELD FOR FIREMEN OR STOKERS.

The accompanying illustration represents a simple and readily available device for the protection of the face of a fireman or stoker from the heat when drawing or raking a fire. It has been patented by Mr. Nikolaus Weber, of Lambertville, N. J. A transparent panel is mounted in a light frame, to the lower edge of



WEBER'S FIREMAN'S OR STOKER'S SHIELD.

which is secured a flap or curtain, preferably made of asbestos cloth. A wire bracket is secured to each end of the frame, having eyes adapted to engage studs fixed upon plates made fast, by rivets or otherwise, to the sides of the cap worn, or to any form of band around the head, if so desired. The plates have outwardly extending studs serving to support the brackets in such position that they will hold the panel in the frame directly in front of the eyes of the wearer, while other similar studs support the bracket in the position shown by the dotted lines in the illustration, when the shield is not needed, and is thrown back on the wearer's head. By this means the shield can be conveniently removed out of the way when its use is not deemed advantageous, and is readily available when protection for the face and eyes is needed.

AN IMPROVED REFRIGERATOR.

A refrigerator so constructed that jars, tubs, and other bulky vessels may be readily placed therein and conveniently handled without causing the temperature of the refrigerator to be materially affected thereby, is illustrated herewith and has been patented by Mr. Clement V. Hill, of Trenton, N. J. Its walls are made double throughout, so that the interior is entirely surrounded by an airtight, non-conducting chamber, and there will be a continuous circulation of cold dry air in each compartment. In the top chamber is a grating on which the ice rests, and in the compartments below are arranged one or more sliding flat shelves, whose side edges are adapted to run in grooves, friction rollers being so arranged that the shelves may be readily moved in and out, while steadily holding any load that they may be required to carry. To prevent the outside warm air from rushing into the refrigerator when one of these doors is opened, while the contents are being removed from a tub or vessel resting on the partially drawn out shelf, spring-hinged doors folding within the compartment are automatically thrown forward to close the opening, these doors gradually closing behind the vessel as the shelf is drawn out. As the sliding shelf is pushed back, the interior doors of the compartment again open to receive the goods. In this way the lower compartments may be advantageously used by dealers in retailing lard, butter, etc., as well as for storage in the ordinary way.

A Noted Elephant.

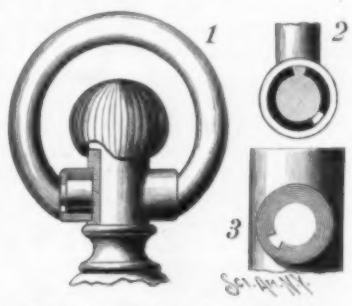
The Ceylon papers announce the death of an elephant named Sella, which had served the Public Works Department for over sixty-five years. Originally Sella belonged to the last of the kings of Kandy, Sri Wickrema Raja Singha, and was one of about 100 elephants which passed to the British government in 1815, when the Kandyan dynasty was overthrown and the whole island passed under British rule. It was supposed at that time that Sella was fifteen years of age, but this was uncertain. In 1880 it was decided that all the elephants belonging to the Public Works Department should be sold, and Sella fell to a well-known resident of Colombo, Mr. De Soysa. The animal aided in several *keddah* operations for the capture and taming of wild elephants, but became totally blind about three years ago. He continued, however, to work at the plow until within a short time of his death. After death the tusks were removed, and measured five feet in length. Sella himself was eight feet high.

Fecundity of the Sunfish.

Last summer Mr. Fred Mather, superintendent of the New York Fishery Commission, computed the eggs in one of our common pond sunfishes. The extreme length of the fish, including the caudal fin, was 6½ inches, and its weight was 5½ ounces. The fish was captured on June 16, and was nearly ready to spawn; the weight of the ovaries was 1¼ ounces. The eggs measured twenty-eight to the inch, making 21,952 to the cubic inch. The displacement of the ovaries in water was a trifle over two cubic inches, and the number was estimated in round numbers to be 44,000, a most enormous number for so small a fish. This fish makes a nest in the sand or gravel, near the edge of ponds or on shallow spots, and, according to Mr. Mather, it is the male fish which guards the nest and keeps off intruders after the eggs are laid, a fact not known to ichthyologists who study fishes after they have been kept in alcohol.—*Signal.*

AN IMPROVED WATCH CASE PENDANT.

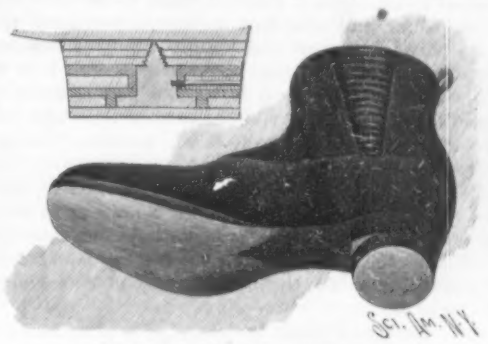
A watch case pendant and bow designed to render it impossible for the bow to become accidentally detached from the pendant is illustrated herewith, and has been patented by Mr. Christian L. Hoefer, of Kearney, Neb. Fig. 1 shows the improvement applied in one form of a watch pendant, represented partly in section, Fig. 2 showing a transverse section and Fig. 3 a side view of the pendant with the bow removed. In the pendant are formed two cylindrical recesses in which are inserted hollow bosses, chambered to form fillets at their outer extremities, and in the fillet of each boss is formed a notch, the notches being preferably arranged at an angle of forty-five degrees with the pendant and ninety degrees with each other. The bow has inwardly turned cylindrical ends exactly in line with each other, and adapted to enter the fillets of the bosses, there being lugs upon the cylindrical ends of the bow, preferably upon the upper side. To insert the bow, it is placed at an angle of forty-five degrees with the pendant, and one of the lugs is entered in a notch of the fillet of the boss; the bow is then turned through three-quarters of a revolution, when the other lug will enter the notch of the fillet in the other boss. The end of the bow springs into the boss, carrying the lug behind the fillet, and when the bow is turned it is so secured that it cannot become accidentally disengaged from the pendant.



HOEFER'S WATCH CASE PENDANT.

AN IMPROVED BOOT OR SHOE HEEL.

An anti-friction heel for boots or shoes, supported to rotate in walking, whereby the wear will be even and uniform on all sides, is shown in the accompanying illustration, and has been patented by Mr. Carl A. Strasser. A metallic frame is provided with a disk-like lower section having a central opening and a depending hublike portion or ring on its under side, this ring forming a socket for the base plate of an axle section, as shown in the small view. The upper section has a central opening to receive the stem of the axle section, and a depending tubular portion which fits over the stem, bearing against the upper surface of the lower section, the latter turning on the axle section and against the under side of the depending tubular portion of the upper section of the frame. To unite the upper and lower and axle sections, a screw is passed laterally into the stem of the axle section, the base plate of which forms what may be styled a turntable, on which the lower section is suspended. In applying the heel, one or more lifts may be secured first in place to provide a proper bearing for the screw portion of the axle section, a suitable number of lifts being secured to the under side of the other sections. This heel is designed to turn as it strikes the ground, thus evenly distributing the wear.

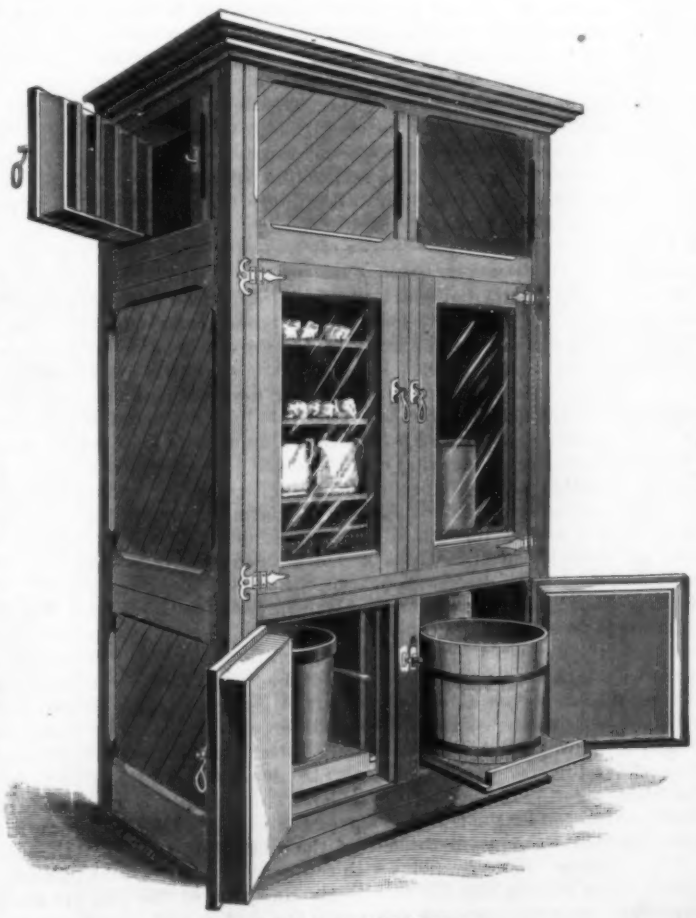


STRASSER'S BOOT OR SHOE HEEL.

For further information relative to this invention, address Messrs. Strasser & Schroeder, No. 222 West Pratt Street, Baltimore, Md.

Electricity Better than Sand.

A series of experiments with a new electrical appliance for increasing the tractive power of locomotive engines has just been successfully concluded by Elias E. Ries, of Baltimore, on the Philadelphia and Reading Railroad. The trials were made on the Frackville grade, one of the steepest on the Reading system, and were pronounced eminently satisfactory in every respect. The apparatus consists of a small dynamo and engine mounted upon the locomotive, and furnishing an electric current, which is passed forward to the rear driving wheels, through that portion of the track rails lying between them. The passage of the current into the wheels and back causes an increased friction between the wheels and the rails, which is claimed to be far superior to that obtained by sanding the tracks, and enables the locomotive to draw a much heavier train, without regard to the condition of the track, than is at present possible. The Frackville grade averages 185 feet to the mile, and with the dynamo running and a train of forty-five cars attached to the locomotive the ascent was made in twenty-eight minutes, while without the current a trip over the same ground with the same train behind required fifty-five minutes. The current used is what is termed a low-tension current, and the increased traction obtained is under complete control by the engineer.



HILL'S REFRIGERATOR.

Ten-wheeled Locomotives.

The Baldwin Locomotive Works are to build for the Erie Railway Company three more of the large ten-wheel passenger locomotives of the same type as those recently built for that road. The *Railroad Gazette* says these engines represent the heaviest class of passenger motors in service, and their use increases the belief that the six-wheeled coupled locomotive will be the engine adopted for heavy express service in the near future. These locomotives have 20 in. by 24 in. cylinders, 68 in. drivers, weight 127,000 lb., exclusive of tender, and have 97,000 lb. available for adhesion. They are adapted for burning anthracite fuel.

Blue Soap.

The object is to produce a blue soap, the use of which renders the subsequent employment of blue in laundry work unnecessary. Incorporate with ordinary soap a solution of aniline green in strong acetic acid. By the action of the alkali of the soap, the green is converted into blue, uniformly coloring the mass.

A Clockwork Lamplighter.

For some time past pedestrians on State Street have remarked a peculiar attachment to the lamp post at the corner of State and Devonshire Streets, and many have been the surmises as to the contents of the little iron box and its usages. With the curiosity usually ascribed to a reporter, one of the *Herald* staff determined to ascertain, if possible, what the curious little box was for, and also how it came to be placed upon this particular lamp post. Supt. Allen, of the lamp department, was visited, and when informed of the object of the visit, said it was an arrangement for lighting the gas at a certain hour each night and turning it out at a certain hour in the morning. In fact, it is a newly invented machine designed to do the work of the lamplighter, with the single exception of cleaning the lamp. It has a clockwork arrangement which is so regulated that it conforms to the moon's changes and lights the gas and puts it out early or late, according to the fullness of the moon or the change in time of rising or setting.

The machine is about the shape of a pear, and contains a clock of the eight-day pattern, which in turn is attached to a fulminate cylinder in which are 400 small pitholes filled with a waterproof fulminate compound, or enough to last a whole year. In place of the alarm on the clock is a spring which is attached to the cylinder, and when the hands of the clock point to the designated hour, the cylinder is turned by a ratchet having the same number of teeth as there are pits on the circle of the cylinder; a spring is loosened, the gas turned on, and a small hammer strikes one of the pitholes, and the result is that the gas is lighted at a uniform hour all over the city, or wherever the appliance is attached. By a simple mechanism, after the gas is lighted the reverse is the order, and at the time at which the clock is set in the morning, the gas is turned off all over the city.

A man is required to visit each street lamp, by the new arrangement, only once a week, to clean the lamp, and at the same time to wind the clock; or, if he should happen to miss a day, the work would be performed just the same by this automatic lamplighter, as the clocks run nine days. The machine is placed in a dust and water proof case, and is so simple that it is almost impossible for it to get out of order. At present a lamplighter is required to make fourteen trips each week for the purpose of lighting and extinguishing the lamps.

Each lamplighter now cares for about eighty-four lamps, whereas by the new method he can care for fifty lamps a day, or three hundred and fifty a week, as all he has to do is to once a week clean the lamp and wind the clock. Last year the cost of labor in cleaning and lighting the lamps of Boston was $8.74 per lamp, while the inventors of the new lighting system claim that the lamps can be cared for, as far as labor is concerned, for four cents per week for each lamp, or $2.08 per lamp per year, a saving of over $6 a year on each lamp, and there are over 10,000 lamps in the city of Boston, thus the saving would be, for labor alone, about $60,000.—*Boston Herald,*

Crude Cocaine.

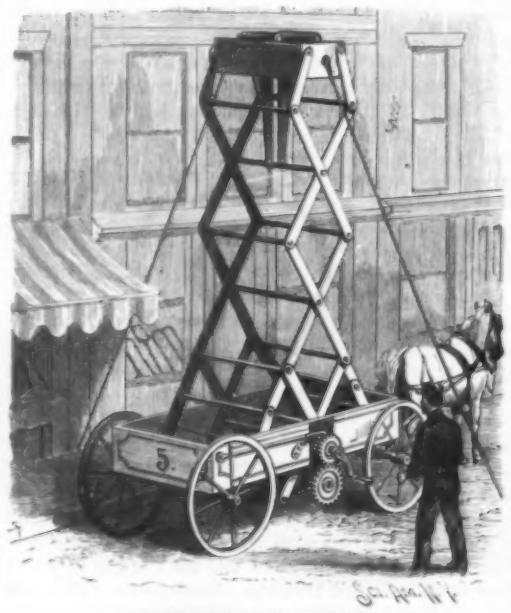
In the current number of *Ephemeris* it is stated that it is highly probable that the importation of cocoa leaves into the States and Europe for the manufacture of cocaine is nearly at an end. For more than a year past crude cocaine has been sent from Peru to the States and Europe in rapidly increasing quantities, and of better and better quality than in 1885, when it was first made. During 1888 the quantities exported from Peru became very large, and the quality reached 90 to 96 per cent, and occasionally even 98 per cent. There are now at least four manufacturers in Peru, and the chief market for their products is Hamburg, and, curiously enough, their products can be had better, cheaper, and in a shorter time from Hamburg than from Peru. Besides this, there is a combination of the makers now to keep up the price and to confine the sales to Hamburg.

Some idea of the very large quantities produced may be had from the circumstance that one maker has a single contract with a European house for 70 kilogs., or about 154 pounds, per month. Another curious circumstance connected with this young industry is that one of the largest and most successful makers is by trade, and was by occupation, a bricklayer when Dr. Squibb's processes were published, and simply took them up as a better and more promising trade for making money. The advantages of exporting the crude alkaloid rather than the coca leaves are many and important. As cocaine is transported in the treasure chests of the steamers the difference in freight is about as ½ pound to 100 pounds of the leaves. But a much more important economy is shown by a comparison of the yield of alkaloid, by the same process from the same leaves, as worked here and in Peru, the yield there being 13 to 15 per cent greater. This is owing to the fact that the leaves in transport undergo deterioration.

Crude cocaine comes either in granular powder or in fragments of press cake of all sizes and forms up to an inch or two in superficial area, and from a quarter of an inch in thickness. The general color is a dull, creamy white, but is rarely quite uniform throughout any package, varying from a dirty or brownish white to very nearly white. But in this matter of color it is constantly improving. The fragments vary more in consistence than in color. A large proportion are hard, compact, and slightly horny when cut or scraped, while others are softer, more porous and chalk-like, and easily cut or scraped, the general density being ligther than the softest, lightest chalk. In Hamburg crude cocaine is nearly all sold upon assays which have generally been in fair accord with each other, and the New York custom house has generally accepted them in adjusting the duty.—*Chemist and Druggist.*

AN IMPROVED FIRE ESCAPE.

A compactly folding fire escape, designed to be readily raised to any desired height, to afford means of reaching the upper floors of a burning building, is illustrated herewith, and has been patented by Mr. Alexander W. Lennier, of No. 49 Harrison Street, Jamestown, N. Y. Two series of levers forming lazy tongs are connected at their pivotal points by rods, the lowermost levers being pivoted at their fulcrums to the sides of a supporting frame or box, mounted on wheels. The lower ends of the bottom levers extend beneath the box, and wire ropes attached to them pass to a central winding drum. To the box are also pivoted bars connected with the lazy tongs by links, forming toggle-jointed braces, whereby the tongs are strengthened and supported, these braces being also connected with the winding drum by wire ropes. On the outer ends of the drum shaft are spur wheels meshing with pinions upon a shaft having crank handles, pawls engaging the pinions to prevent backward motion while the tongs are being raised and to hold them in position when the desired elevation has been reached. At the top the ends of the tongs are fastened to a platform or car adapted to hold several men. The device is so constructed that it can be readily adjusted to any unevenness of the ground, and guy ropes are fastened to the car to steady it in raised position if desired. When not in use, the escape shuts down into the truck, so as to be easily transported.



LENNIER'S FIRE ESCAPE.

Discovery of a Sunken War Ship.

During the dredging operations now going on in the port of Santander, Spain, the well-preserved remains of a war ship were encountered at the entrance to the harbor, partly buried in sand and mud, which must have gone down in that spot four centuries ago. As the dredges could not remove the old hull, the Spanish government ordered it to be blown up, and to employ divers for saving what could be saved. The work has turned out a very profitable one, and great care is consequently displayed. The vessel dates probably from the end of the fifteenth or the beginning of the sixteenth century. Guns and other equipments raised show the united coats-of-arms of Castille and Arragon, and some bear the scroll of Isabella la Catolica, others the crowned F of Ferdinand the Catholic. As among the numerous arms found on board there are many of Italian or French origin, and the vessel appears to have served as a transport, it is generally supposed that she belonged to the expedition of Gonzalo de Cordoba against Naples, and that she foundered on her return from Italy, laden with trophies and plunder, on entering the port of Santander. This surmise is supported by the fact that among the coin saved there are besides Spanish coinage of the time of the Catholic kings, numerous coins with the head of Charles VIII. of France, and the various Italian states of the time. Since the dissovery was made, the diving and saving operations are carried on with great energy, as it is hoped to meet with valuable finds from an expedition which was particularly rich in plunder.

Peat Paper.

At the recent meeting of the British Association, J. A. London, of Newcastle, read a paper on the utility of employing peat fiber in the making of brown paper, wrappers, millboards, etc., of which the following is an extract:

The object of the writer of this paper is to show the practical uses of suitable peat fiber as a raw material in the manufacture of brown paper, wrappers, and millboards; and its economical use in many ways. The machine the writer uses for treating this material is a "willow," or "devil," consisting of one drum 3 ft. diameter, but 12 in. on the face. This drum is covered with a concave. Both the drum and concave are furnished with cone-shaped teeth, so that the fiber cannot adhere to the teeth; but the principal advantage is that the teeth can be set to fiberize to any degree of fineness. Owing to the speed at which it runs, no fiber hangs about the machine, and it will fiberize or tear the peat fiber in a wet or dry state.

Lord Dosse said that he was very glad to hear that peat fiber had been used in the way described. There were extensive bog areas in Ireland, but they were principally inland, and the cost of bringing the peat to the seacoast was as great as bringing it from Hamburg or some other German port. He noticed that some newspapers tore readily, and he thought this was attributable to the use of peat fiber or some other of the modern substitutes. But if the fiber was strong enough for its purpose, that was all that was required.

Mr. London said the saving, compared with wood pulp, would be about 50 per cent. The chemical treatment which the fiber underwent made it stronger than wood pulp. The fiber was already used in about five mills. One mill on the Tyne used about twenty tons a week, and another mill used it very extensively, and it was gradually, but surely, taking the place of old bagging, which was injurious to workpeople.

The president said it was a novel manufacture that had been introduced to them for the first time, and it was very interesting and very useful.

Close Observation of a Waterspout.

Among the reports of the Hydrographic Bureau for October is the following remarkable account of a waterspout by Chief Officer Calloway, of the American steamship Santiago:

"On the 29th day of April, 1889, at about 6:30 A. M., Royal Island (one of the Bahamas) bore about south, distant four miles; wind light from south-southeast, weather partly cloudy. Observed a waterspout forming off the starboard bow (ship heading southwest) and moving in direction of steamer at an angle of three points. On account of its close proximity, was about to steer clear of it, when I observed it breaking, about thirty yards from the ship. Immediately afterward the steamer passed through the outer edge of the whirlpool, the diameter of which I should judge to have been about fifty to seventy yards. On passing through the outer edge I observed that the center was hollow, the water circling from west to east, or against the sun. The water that fell on deck was very salt, and the drops as large as a fifty cent piece. During the few seconds of our passage through it, the wind blew at the rate of about thirty or thirty-five miles per hour. I did not observe any calm in the center at all, the water arising from it resembling an inverted fountain. After clearing it the wind resumed its original force, about fifteen miles per hour. Being the officer of the watch, I had little time to observe the barometer, but it fluctuated one or two hundredths, and then resumed its previous reading. The clouds above and around the spout were very ragged and much disturbed, similar to those in a thunder storm; their motions were very rapid, ascending, descending, and breaking away from each other after the water had been absorbed into them. The water was whirling very rapidly for several minutes after the break, showing what tremendous circular force there must have been. Upon passing through it the steering of the ship was not affected, so that if there were any current at all, it must have been circular and confined to the center."

A Useful Cement.

For the cementing of iron railing tops, iron gratings to stoves, etc., the following mixture is recommended: in fact, with such effect has it been used as to resist the blows of a sledge hammer. This mixture is composed of equal parts of sulphur and white lead, with about one-sixth proportion of borax, the three being thoroughly incorporated together, so as to form one homogeneous mass. When the application is to be made of this composition, it is wet with strong sulphuric acid, and a thin layer of it is placed between the two pieces of iron, these being at once pressed together. In five days it will be perfectly dry, all traces of the cement having vanished, and the work having every appearance of welding.

Correspondence.

The Original Oil Well Made by Drake to be Reworked.

To the Editor of the Scientific American:

In 1859 the first oil well was drilled on Watson's Flats, one and a half miles from our city, by Colonel Drake.

For years the old well has been abandoned, but now one of our citizens has purchased the property, built a new derrick over the old hole, and will use nitro-glycerine to try and restore it to a paying well.

One half mile south of this well is located "Crosley's" wells, and there is one of the group 29½ years old still pumping four barrels.

Recently I surveyed the premises, and before November 1 we should know the output of the old Drake well.

Since Drake started this industry there have been over 40,000 wells drilled and over 365,000,000 barrels of oil produced, exclusive of the field known as the "Lima Field," and yet no monument save this derrick rises to commemorate his name. C. L. GIBBS.

Titusville, Pa.

Beet Sugar in California.

To the Editor of the Scientific American:

In the October 12 number of the SCIENTIFIC AMERICAN a correspondent makes the erroneous statement that "in the Pajaro Valley, at Watsonville, Cal., 100 miles south of San Francisco, is located the only beet sugar manufactory on the American continent."

The beginnings of the California beet sugar industry were in Alvarado, Alameda County, and within 25 miles of San Francisco. And, furthermore, at the present moment there is a factory in full operation at the same place.

In fact, since 1869, when the first California factory was built, there has been, with the exception of a few years, a factory in operation at Alvarado.

Various factories in the Sacramento and Santa Cruz valleys had failed. The first beet sugar mill to operate with financial success was located at Alvarado. A few years ago a disastrous boiler explosion ruined it, but in a short time a new factory of greater capacity was put up, and it is now passing through the second campaign with great success.

Mr. Spreckels has had no connection with it. It was not until after the Alameda factory had demonstrated the practicability of complete technical and financial success that the Watsonville mill was built.

If you see fit I have no objections to your publishing this communication; however, I simply wish a definite correction. HUBERT P. DYER.

Berkeley, Cal., Oct. 24, 1889.

Right or Left Leggedness.

To the Editor of the Scientific American:

Noting the interesting report of Dr. Sibley's paper in the SCIENTIFIC AMERICAN of October 26, I was reminded of some observations of my own, made several years ago, with regard to the comparative action of the legs, the result of which does not altogether accord with Dr. Sibley. As a general rule, I found that the right leg of an active man is longer and heavier than the left, in correspondence with the greater size of the right arm. Its employment in preference to the left leg in almost all conditions that require special muscular effort on the part of the limbs should tend to give it greater volume. It will be seen, I think, that people when standing quietly rest more upon the right than the left. When a company of soldiers is brought to a halt, and ordered to "stand at ease," the right leg is thrown a little back of the left, the left leg is relaxed, and the right leg receives the larger part of the weight. When the soldiers start to march, the left leg is first advanced, but the right foot and leg give it the special impetus forward.

I have observed that in walking the right leg tends to overreach the left, or as it were to swing around it. This is my principal difference with Dr. Sibley. In automatic, unconscious walking, when one is careless of direction, this tendency is exhibited. Inquiry has shown that others have observed a tendency to turn toward the left rather than the right when one is lost in a strange neighborhood. Some years ago, while in conversation with General Heintzelman, this topic was broached, and the general gave it as his belief that soldiers in marching tended to wheel toward the left. He related an incident of a company that during war was detailed for certain duty in a section of country in the Southwest that was entirely new to the officers. They in fact got lost in the woods, and for two or three days wandered about before they were able to take up the direct line of march. During this time it was found that they had made at least two complete circuits, both toward the left and entirely without knowing it. I think this subject is interesting enough to warrant its further consideration, and I should be pleased to see other comments on it in the columns of this paper. H. S. DRAYTON, M.D.

775 Broadway.

Low Tension and More Copper Required.

In the course of an admirable address before the Electric Club, of this city, Dr. Leonard Waldo, of Bridgeport, Conn., referred to the condition of the electric light industry as follows: We know that the light of the twentieth century is to be found in electricity. We know that we are public benefactors when we turn the light of electrical day into the dark corners where crime and pauperism make property unsafe and life wretched; and yet I think there is not one of us but feels in our inner hearts that there is something wrong when we allow our angel of life and light to become an angel of death.

It is a stinging rebuke to our scientific and business enterprise when this faithful lineman or that ignorant and inoffensive child becomes a victim to the power we are distributing.

We all know the steady battle which progress is always waging. Perfection only can come after this difficulty and that, unforeseen at the commencement, have been surmounted.

Each individual case of the applications of electrical power presents new difficulties and different ones from any of its precedents. The lighting of a closely populated metropolis is a very different problem from that of lighting a coal mine or a village; in the metropolis the electricity is harnessed to many needs; the exquisitely delicate telephone, the heavily belted engine, the telegrapher's key and sounder, and the electrical plater's vats, are all members of the swarm of electrical powers. They each have their rights; they each have their representatives in such a club as ours. Nowhere else can the fruitful tree of concerted action be so well planted and tended as around the genial fires of our club.

It has happened to me in the line of professional work to have been in charge of the most powerful dynamos the art of man was able to construct at the time of their erection. I have seen those dynamos running day and night tended by relays of ordinary workmen and blazing away continuously from three to six thousand amperes of current and feeding the blinding mass of electricity through groups of seven carbons, each carbon 2½ inches in diameter, in the furnaces which were melting the sands of the sea, and in which firebrick melted and ran like molten metal.

I have seen the connections of copper cable handled with the utmost impunity by the commonest day laborer around the works, and with no more thought or concern than he would have shown in handling a spade or crowbar.

The current through the twisted cables produced about the copper so strong a magnetic field that a small bar of iron would be held by the copper cable as by a magnet.

I suppose that the amount of current ordinarily proving fatal is between one-tenth and one-twentieth of one ampere, and that the laborer handling such furnace conductors would be instantly killed if so much as one-fiftieth thousandth of the current left the bare conductor and passed through a vital organism.

Now, is there any very good reason why conductors which are meant to deliver at arc light terminals, say 10 amperes current, should be so fraught with danger when their insulation is broken?

Is it the price of copper which makes multiple wire distribution too expensive? Is it the invasion of the patent field by men who have been quick to combine old principles and common knowledge into new combinations by which vested capital was protected by the courts? Have our engineers made the mistake of forgetting the value of human life, and networked a community with conductors having poor insulation from within outward, and who have failed to anticipate the necessity of protection from without inward?

It is not so difficult to make the current keep its proper path by outward insulation, but it is very difficult to make the insulation stay where it is put when attacked by the chemical destroyers in the air and the physical accidents of storms, cuts, and blows.

As to burying such conductors, about all that can be said is that they will make a very lively graveyard for some of their mild-mannered and inoffensive telephonic and telegraphic fellow corpses.

In Paris they are fond of catacombs and underground tunnels and that sort of thing, but in New York the earth beneath and the waters under the earth conspire to make such burial probably impracticable. As it was said of marriage, it might be a failure, but celibacy was a much greater one.

Now, if copper profitably mined at 6 cents and paid for by us at 11 is too expensive to establish the proper mains in New York for low tension lighting, it is right here and among our own possibilities that we can discuss and formulate the legislation necessary to give us raw material for making metropolitan electric lighting safe and economical; the low tension current of such an electrical furnace as I have before referred to would supply perhaps 5,000 incandescent lamps with perfect safety, but to distribute these lamps will require plenty of copper, and the ultimate economy of long distance transfers of light or power is a question of the cost of copper.

Copper with us is raw material, and after our bitter experience with the copper syndicate I can conceive of no argument which can be used with electrical people for adhering to a protective tariff on copper.

There is no use in the gas people thinking that they are the people to furnish light. For lighting purposes gas is as certainly doomed as the stage coach upon the appearance of the railroad. The province of gas in the future is to supply heat and not light, and if we are temporarily exposed to the comment of an indignant public, it is because we have builded according to the light we then had and not always wisely nor well, and have been hampered too much by the ignorance of legislators or the importunities of stockholders, and have strained the capacities of individual lighting systems by placing them in positions for which they were not on the whole adapted.

The energy and practical skill of the exploiters of any given system are dangerous to the community, unless they are accompanied by the kind of knowledge which informal discussion in such a club as ours would give. The public once roused is a good deal of a mob, and they are apt to fall upon the just and the unjust alike; it is for us to play a strong part in moulding and enlightening such public opinion, and to see to it that our social standing and the good, honest work which we do is such as to make us a power in the community in any cause which we champion.

Fossil Remains in Oregon.

The John Day region in Oregon was the scene of the Princeton University scientific expedition last summer, and as a result a grand collection of fossils was obtained.

From the Blue Mountains westward to the Cascades the country is a great volcanic plateau, made up of lava sheets piled one upon another and indicating ancient volcanic outbursts upon a stupendous scale, in comparison with which such vents as Ætna and Vesuvius are the merest pygmies. Through this mass of lava the streams, aided by the atmosphere, have cut deep valleys, some of them broad and open, others deep, gloomy canyons.

This country is very dry, but the soil is excellent, and where irrigated it produces well, the vegetables and fruit being of particularly fine quality. Great areas that are now arid sage brush deserts will one day be turned into fertile farms by means of artesian wells, and the mild climate will insure success. At present the great industry is wool raising. The enormous bands of sheep utterly destroy the grass of the country over which they range, till it looks as if a plague of locusts had visited it.

The scientific attraction in the John Day region is the vast assemblage of fossil animals which is entombed in the rocks there. This entire district was in a former geological age the bed of a great fresh-water lake, into which the streams brought masses of sand and mud and volcanoes showered cinders and ashes. Animals which were swept into the lake in times of flood became covered with silt, and as the latter was in the course of ages consolidated into rock, the bones of the victims were gradually petrified and thus indefinitely preserved. Now the rock is slowly disintegrated by the action of the rain, snow, and frost, and the bones exposed to view or even washed entirely out. For the most part, however, the specimens must be cut out with pick, hammer, and chisel, a very laborious process, as the rock is often extremely hard and the blazing summer sun makes the face of a white cliff anything but an ideally comfortable place.

Could we reproduce a view of that ancient Oregon when the John Day Lake existed, we should find ourselves in a very strange animal world; little three-toed horses hardly larger than donkeys, rhinoceroses, camels, peccaries—a great assemblage of large and fierce cat-like, dog-like, and hyena-like animals—not to mention hosts of little rabbit and squirrel like creatures. The animals of this time were all rather small, the largest being the entelodon, a beast not unlike the hippopotamus in size and general appearance. As the list shows, this assemblage has a very Oriental character. The climate was perhaps rather milder than at present, and the forests, of which the leaf beds on Bridge Creek give ample illustration, were like those now found in the warmer parts of the United States.

This wonderful museum of a buried world has been sealed up by the subsequent lava floods, and is now accessible only on the sides of the canyons and valleys, where the streams have cut down through the overlying volcanic masses.

A Novel Form of Price List.

The Lunkenheimer Brass Manufacturing Company, of Cincinnati, is using a novel means of presenting its specialties to customers, by printing a price list of several pages in copying ink, the pages to be torn off and signed by a customer asking discounts, the added matter then all being made in copying ink by the company, and a copy taken. By this means an exact record is kept, involving but little labor, and one which cannot fail to be a great convenience in any following business transactions.

THE ELECTRIC TACHYSCOPE.

(*Continued from first page.*)

rangement, all portions of the image of the moving figure are made extremely sharp.

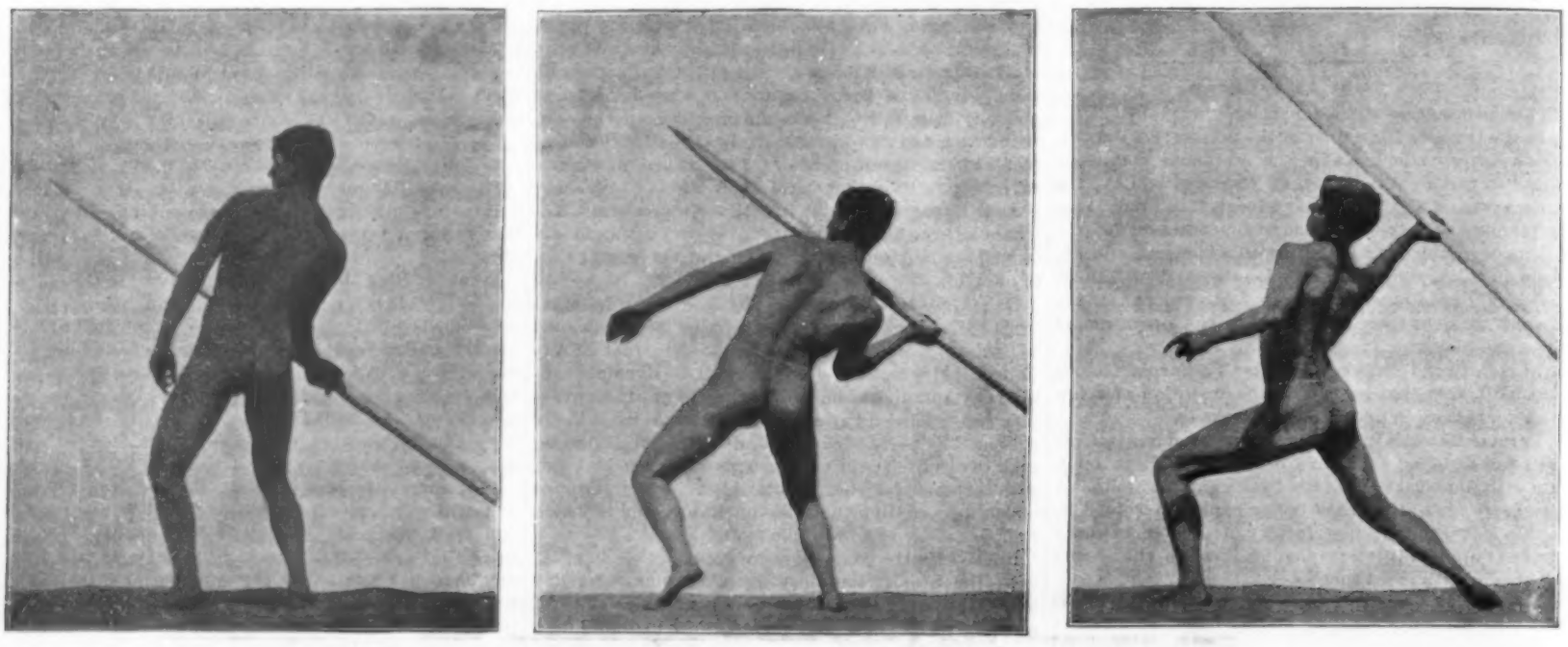
A series of these instantaneous pictures representing an athlete throwing a javelin is shown in the annexed engraving. These pictures arranged in the zoetrope give the usual effect, but with much greater perfection than can be expected from engraved pictures.

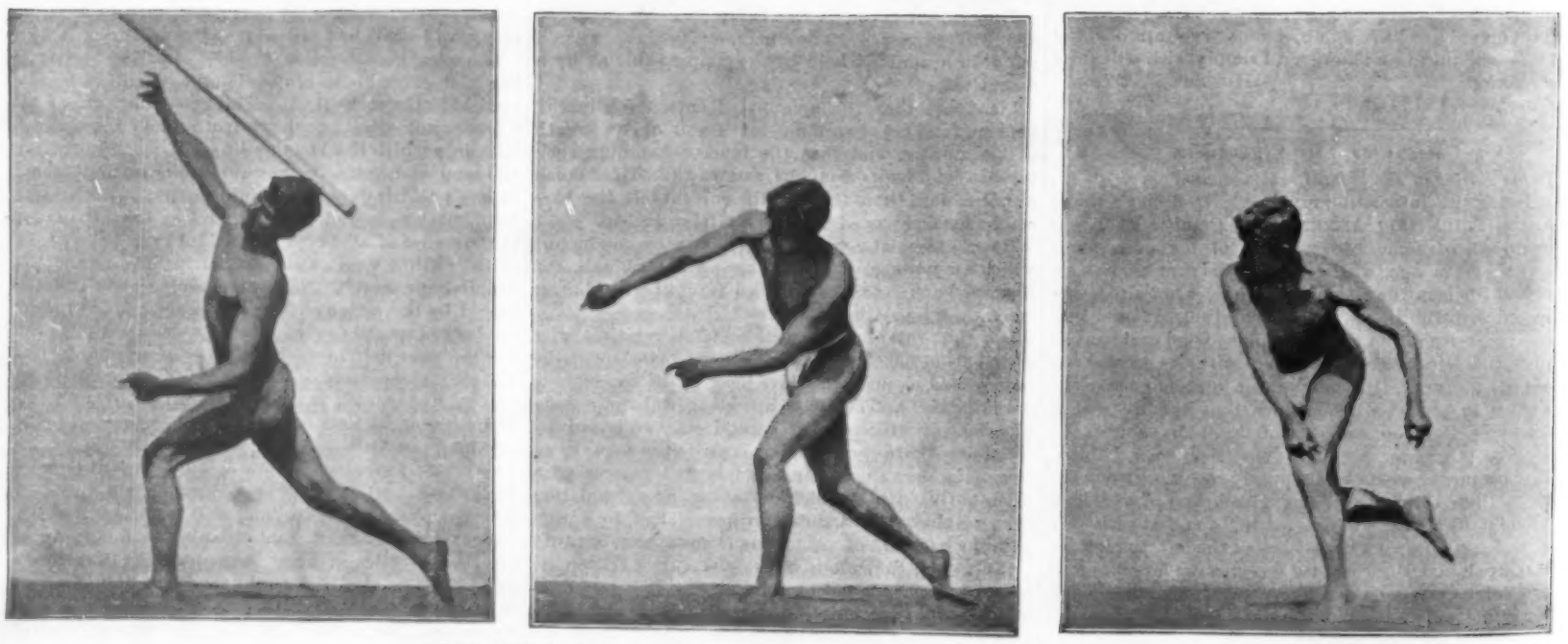
Mr. Anschuetz has invented apparatus by means of which these pictures may be exhibited in a very perfect manner. This instrument (which is shown in our large engraving) is known as the "electrical tachyscope." It consists of an iron wheel of sufficient diameter to hold an entire series of these pictures on its periphery. This wheel is arranged upon a rigid standard, and provided with a series of pins which register exactly with the pictures. Upon the standard, behind the wheel, is located a box containing a spiral Geissler tube which is connected with the terminals of a Ruhmkorff coil. The primary wire of the coil is provided with a contact maker and breaker adapted to be operated by the pins projecting from the wheel, so that every time a picture comes before the Geissler tube, it is illuminated by an electric discharge through the tube. This discharge being instantaneous shows each picture in an apparently fixed position, and these pictures succeed each other so rapidly that the retinal image of one picture is retained until the next is superimposed upon it, thereby giving to the observer the sense of a continuous image in constant motion. A horse jumping a hurdle is a favorite picture. Many positions taken by the horse, as well as by the rider, are truly surprising.

The ancient Greeks seemed to have had a more accurate power of vision than modern artists. A relief on the Zeustemple in Olympia shows a wild prancing horse standing on one of its hind legs. Modern artists always represent prancing horses standing on both hind legs. In many of Mr. Anschuetz's pictures we find prancing horses standing on one leg, as represented in the ancient statuary. The positions taken by an acrobat while leaping through the air are very curious.

The electrical tachyscope is exhibited by Messrs. C. B. Richards & Co., of No. 3 East 14th Street, New York City.

Mr. Anschuetz's work has been greatly admired in Europe, and will, doubtless, also find great favor in this country.





INSTANTANEOUS PHOTOGRAPHS USED IN THE TACHYSCOPE.

Genesis and Progress of Invention.

Invention began, says the *Inventive Age*, in the Garden of Eden, when the primal pair invented the fig leaf apron, and it has been in progress through all the hours that, since that day, have gone to join the cycles that elapsed before the creation of mankind. Every successive generation has found out something that its predecessor did not know. Not only the necessities of the race, but its unquenchable desire for extending the area of knowledge, and its natural aversion to hard work, have stimulated the inventive faculty. All that there is on this globe, except wild vegetation, wild animals, and wild men, naked and houseless as their quadrupedal companions, has come of invention. The history of invention, could it be written, would be a detailed story of mankind from Adam to the babe born to-day.

The grandest achievements of this godlike faculty are, however, of recent date, and they have come in such a magnificent procession, with results so marvelous, that a doubt exists in many minds as to the possibility of maintaining this pace through coming centuries. Ours is called "the age of invention," in contradiction from past ages, but the impression is abroad that, in ages yet to come, ours will stand out as preeminently the inventive age. Why? What reason can be assigned for the supposition that a hundred years from 1889 our descendants will not be as far ahead of us in science and its applications as we are superior in that respect to our ancestors of 1789?

It is our belief that, instead of having explored the inner temple of science, we have just entered the vestibule of the outer temple. Progress is a logical necessity. Every step points and impels to another step. We cannot believe the time will ever come when no more possibilities will be presented to the inquiring mind, when science will regard its work as finished, and the inventor will lay down the prod of exploration, feeling that his occupation is gone.

Mental Capacity due to Brain Surface.

In an article in the *Popular Science Monthly*, Dr. M. A. Starr says that "there are many interesting facts which make one believe that the greater the extent of brain surface in a man, or, to put it a little differently, the more the folds and deeper the creases between them, the greater are the man's mental powers; and just here it becomes apparent that to judge of the extent of the entire brain surface by the size of the head, or by the extent of the superficial irregular surface which is covered by the skull, without any regard to the number of folds or their depth, is to fall into an absurd error, and here we begin to see how baseless the old phrenology really is. For a little brain with many deep folds may really, when spread out, have a larger surface than a large brain with few shallow folds, and a so-called bump or elevation on the apparent surface of the organ, even if it produces a corresponding elevation on the head, which it frequently fails to do, will indicate nothing regarding the number of folds or the depth of the creases which lie about it, so that it may be stated without hesitation that from the size or shape of the head no conclusion whatever can be made as to the extent of surface of the brain, and consequently no conclusion can be reached regarding the mental capacity."

PROFESSOR C. RICHARDSON, of the agricultural department, says that the average amount of water contained by flours of eight Eastern States which he examined was 12·49 per cent, while Minnesota and Dakota flours only contained 8·96 per cent. From these figures he deduced that, "other things being equal, a barrel of Western flour would make more bread than a barrel of Eastern flour."

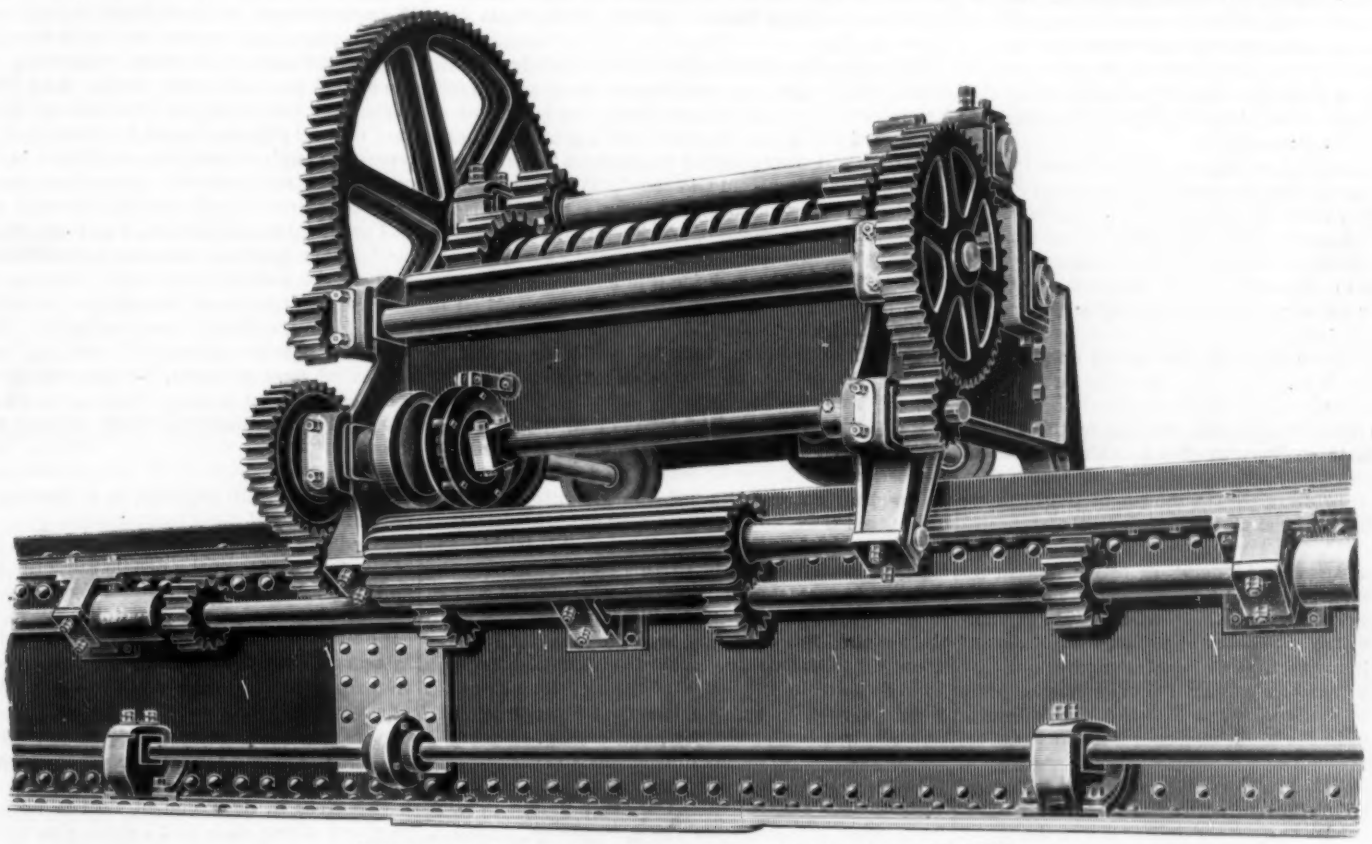
TEN TON TRAVELING CRANE.

We illustrate a ten ton traveling crane constructed by Messrs. Davy Brothers, Limited, Park Iron Works, Sheffield, and designed to do the lighter work in a large machine shop which was already equipped with a sixty ton crane by the same makers. The construction of the crane, says *Engineering*, was influenced by the fact that the extreme width was limited to 7 feet. The following are the various speeds:

	Ft. per minute.
Traveling speed	100
Cross traversing speed	52½
Hoisting and lowering speed	5½

The chief interest of the design lies in the means for communicating the motion of the longitudinal shaft to the crane, and the motion of the cross shaft to the crab. The usual arrangement of a square or grooved shaft, with its unsatisfactory tumbler bearings, has been abandoned for a plan patented by Mr. Charles Davy. This consists in fixing a number of spur pinions at equal distances on the line shaft, and in applying to the moving body which has to be driven a spur drum long enough to come into gear with one pinion before leaving the preceding one. In the engraving it is the shaft which drives the hoisting and racking motions which is thus equipped. One advantage of this arrangement is that the bearings can be equipped with caps and lubricators, and consequently the shaft may be run at a relatively high speed, and may therefore be lighter.

The weight of these cranes, of which several have been made and have answered admirably, is about 30 tons, and they lift up to 40 or 50 per cent above the nominal capacity.



IMPROVED DRIVING GEAR FOR TRAVELING CRANES.

Why Some Mills Fail.

The two chief causes of failure in flour mills at the present day are bad office management and wasteful milling. The manufacture of flour is in different conditions from what it was ten or twelve years ago. Then a man of small ability and limited experience could run a mill with considerable profit. But those times are, I believe, gone forever.

Sometimes a mill that started in profitably comes to a turning point and begins to lose money. When this is the case, it will not avail to curse the times and the fluctuations of the times. The thing to be done is, by means of frequent balance sheets in the office and frequent tests in the mill, to ferret out the true cause, and then apply the remedy. This may involve the discharge of a trusted wheat buyer, manager, or head miller, but it is the only thing that will save the enterprise from shipwreck.

One of the gravest mistakes that can be made in milling, and one that has more than once come under my observation, is that of changing, for the sake of a small apparent saving, to a poorer grade of wheat. Let a mill build up by steady adherence to a high standard of product a profitable home demand amounting, we will say, to a hundred barrels daily. Then let that mill begin to use inferior wheat, putting the product out under the same successful brand, and in thirty days its flourishing trade will be knocked endwise—just to save three or four cents a bushel on wheat.

But this saving on wheat, I can show, is not actual. We will take a 5,000 bushel lot of good wheat, mill it into flour, and calculate the yield. Next we will take 5,000 bushels of poor wheat and treat them in like manner. Comparing results we shall find, I am confident, that the first lot has yielded not only more barrels of flour, but a greater percentage of high grade than the second. I scarcely need add that successful milling to-day hangs on high grade percentage.

Another important matter, often overlooked by millers, is the proportion of loss or waste to each barrel of flour. There are mills in which the total waste averages as high as four pounds to every barrel of flour manufactured, while others there are where it is kept down to one and a half. Four pounds seems to me a good deal, yet some millers habitually allow for that average of loss without special test. Others mill as though there were no such thing as waste or loss.

There is no skill or cunning so great that it can for any long period foist a poor quality of flour upon the market without detection and loss. The public may be fooled for a time, but sooner or later they will note the difference and punish the deceit.—*Roller Mill.*

The Westinghouse Electric Company.

The name of Mr. Westinghouse is familiar to the public in this country and on the Continent by its association with the continuous air brake so generally in use throughout Europe, and especially to those connected with railway management who remember the long and earnest fight he carried on, and the successful issue of the protracted struggle. After his return to America some years since, and when he had succeeded in establishing his system of brakes as the only one recognized to any extent on the United States railroads, George Westinghouse turned his attention to another gigantic undertaking, the utilization of natural gas in and around Pittsburg, and it was almost wholly due to his efforts that the conditions of industry in that great manufacturing center have been revolutionized. Not content with these two great enterprises, which would have sufficed for the career of any half-dozen ordinary men, Mr. Westinghouse found it necessary to discover some new outlet for his energies, this time in the direction of electrical industry. In February, 1886, he organized in Pittsburg the Westinghouse Electric Company, and this, like his other enterprises, has grown into great proportions, and is brilliantly successful. One factory at Pittsburg employs 1,200 hands, another at Newark, N. J., has 600, and a third in New York City, 400 hands. In addition to this, the Westinghouse Electric Company has leased, in other words acquired, the business of the Sawyer-Man Electric Company, the Consolidated Electric Light Company, the United States Electric Light Company, the Waterhouse Electric Manufacturing Company, and the Tesla Electric Light Company. The parent company was the first to introduce into the United States the alternating system, under the Gaulard and Gibbs patents, and no less than 235 central lighting stations, which are now at work in America, have been carried out by the company. Mr. Westinghouse, considering that the time is come for extending throughout Europe the business he has so largely developed at home, has recently established an association in London, which, under the name of the Westinghouse Electric Light Company, Limited, has now commenced operations with a capital of £600,000, or $3,000,000.

The special object of this company is to manufacture and sell electric light and power machinery of every description, although the alternating current system will be made the special feature of the business. The manufacturing scope of the company will indeed be very large, as it intends not to limit itself to any particular class of apparatus. In addition to all the patents owned and controlled by the parent company, the London Association are the proprietors of Dr. Hopkinson's three-wire patents, under which the Edison Company is working in the United States. The offices of the new company are at No. 4 Victoria Mansions, Victoria Street, and its factory will be situated in Canal Road, King's Cross, immediately adjoining the works of the Westinghouse Air Brake Company. These works are not yet completed, and, till they are in working order, machinery and apparatus will be imported from Pittsburg to fill orders. The officers of the Westinghouse Electric Light Company—the capital of which is £600,000—are George Westinghouse, Jr., president; Captain Francis Parry, vice-president; Mr. H. M. Byllesby, managing director; and Mr. A. G. Scanes, secretary. Sir Henry Tyler and others are on the Board of Directors. With the wide and successful experience obtained in the United States, with practically unlimited means at his disposal, and with the wonderful energy, ability, and enthusiasm possessed by Mr. Westinghouse, and which he knows how to impart to his immediate collaborateurs, there is little doubt but that the formation of this company will attain his object—that it will reach the same position as is occupied by the parent company. The time is well chosen for making the attempt, now that a fresh impetus has been given to electric lighting industries in this country, and there seems every prospect of a solid and increasing business in the immediate future. The competition thus introduced from abroad will prove a healthy stimulus to English manufacturers, and it is probable that the energy and enterprise of Mr. Westinghouse will make itself manifest by an extension of electric lighting, and the installation of central stations, both for light and power transmission, in many directions, in addition to the mere manufacturing and supply business which the new company has been formed to develop.—*Engineering* (*London*).

Technischer Verein von New York.

The trustees of this new "Technical Society of New York" are as follows: President, Paul Goepel, C.E.; vice-president, E. L. Heusner, M.E.; corresponding secretary, Max C. Budell, C.E.; recording secretary, Eugene Dieterich, Arch.; treasurer, Charles Heinecke, M.E.; librarian, Franz Knauer, C.E.; chairman of Section I. (civil engineers), Wilhelm Hildenbrand; chairman, of Section II. (mechanical engineers), D. Petri-Palmedo; chairman of Section III. (architects), H. W. Fabian; chairman of Section IV. (chemists and metallurgists), Th. Lungwitz; chairman of committee for arrangements, George E. Berna; chairman of committee for employment, George W. Wundram; chairman of committee for publication, Augustus Kurth.

Natural History Notes.

The Pitchers of Sarracenia.—From an examination of the anatomical structure of the pitcher of *Sarracenia Drummondii*, Mr. E. Heckel concludes that it represents a hollow petiole, while the opercule represents the lamina of the leaf. The resemblance in structure is very close to the petiole of the water lily (*Nymphæa alba*), and the near affinity of the Nymphæaceæ and Sarraceniaceæ cannot be doubted. The structure and arrangement of the vascular bundles are very similar. The parenchyma of the petiole of the water lily contains large numbers of air cavities lined with hairs.

In the pitcher plant, these appear to be fused into one large central cavity, the cavity of the pitcher, in which we again find the hairs that prevent the escape of captured insects.

Color of Birds' Eggs.—Mr. A. H. S. Lucas, in Transactions of the Royal Society of Victoria, discusses the question as to how the coloring of birds' eggs has been acquired, and how it came to be protective, or otherwise beneficial.

He considers that the effects of the surroundings, during the time of the formation of the shell, upon the mental or nervous constitution of the bird, is a very important factor in determining the coloring of the eggs. Numerous illustrations of this are noted. Any variations of value in rendering the eggs less conspicuous are seized on by natural selection and transmitted by heredity. Individuals at the present day are influenced in part by the surroundings, but mainly restricted by the tribal habits of generations. Hence there is sufficient adherence to type to make an experienced collector tolerably sure of the species of a bird to which a particular egg belongs, while, at the same time, there are considerable differences even between eggs of the same clutch.

The Sensitive Plant.—After a series of experiments on the phenomena of propagation of movement in the sensitive plant (*Mimosa padica*), Mr. D. D. Cunningham concludes that it is due to mechanical causes connected with the transference of water, together with peculiarities in the structure of different masses of tissue, rather than to the contractility of the protoplasm.

The following are some of the results upon which this conclusion is founded: The intensity in the propagation of the movement is proportional to the ease with which variations in the tensions of the tissues spread themselves. The direction in which the movement advances is, in many cases, that in which variations in the tensions of the tissues can be determined; while they cannot be explained as a result of protoplasmic conduction. The order of succession of the excitations in cases of advancing irritation is often inexplicable on the theory of a continuous conduction of protoplasmic irritation, while it can be easily explained as the result of variations of pressure in masses of tissue differing in their anatomical structure.

A Large Dragon Tree.—In a paper in the current number of the *Revue des Sciences Naturelles Appliquées*, on vegetation in Portugal, reference is made to an extraordinary dragon tree (*Dracæna Draco*) growing in the garden attached to the royal palace at Ajuda, near Lisbon, which is supposed to have attained a development unequaled by any other similar tree in the world. The crown of the tree, the under part of which is scarcely 3 meters from the ground, is upward of 36 meters in circumference (about 120 feet), and in its upper outline forms a perfect dome. There is a tradition that this tree was imported and planted in the garden when it was first created, upward of three centuries ago.

The Color of Seeds.—Mr. Louis Claudel has undertaken at the botanical laboratory of the Faculty of Sciences, of Marseilles, a series of studies from which it results that the coloring matters of seeds affect two states: they either impregnate the membrane of the cells or fill their cavity.

The first is the much frequenter state, and it might be said that the second forms an exception merely. Of the pigments that constitute these coloring matters and that are inclosed in the cellular cavity, some are liquid and sometimes exhibit the entire gamut of colors, from red to violet. They are nothing more than the result of a modification of the cellular juice. The other intracellular solid coloring matters are of direct protoplasmic origin, for, at the moment at which the coloration begins to show itself, there exists in the cells nothing but protoplasm. The green or colorless leucites have thoroughly disappeared before this epoch. Upon the whole, the solid pigments of seeds hardly ever exhibit themselves in the state of leucite, and are derived directly from protoplasm. Such characters put them in opposition to the pigments of flowers and of the pericarps of fleshy fruits, which, according to Flahaut, Schimper, and Courchet, are derived from pre-existing leucites, and affect well defined forms.

Increase of Animal Life.—Compared with the rest of animal nature, infusory animalcules are undoubtedly the most numerous; next come worms, insects, and fishes. After these are the amphibia and serpents, birds and quadrupeds, and, lastly, man.

The human female produces generally but one offspring at a time, and that after a considerable interval from her birth, and but few during her whole existence. Many quadrupeds are subject to similar laws, while others are more prolific, their fecundity being little, if at all, inferior to that of certain birds, for they will produce twenty or thirty young at a time. Several birds breed frequently in a year, and will lay more than a single egg at a time.

How prodigious is the difference on descending to the classes pisces, amphibia, reptilia, insecta, and annelida!

Yet among them the numbers cannot be more different. According to naturalists, a scorpion will produce 65 young; a common fly will lay 144 eggs, a leech 150, and a spider 170. A hydrachna produces 600 eggs, and a frog 1,100. A female moth will produce 1,100 eggs, and a tortoise 1,000. A gall insect has laid 50,000 eggs; a shrimp, 6,000; and 10,000 have been found in the ovary of an ascaris.

One naturalist found over 12,000 eggs in a lobster, and another over 21,000. An insect very similar to an ant (*Mutilla*) has produced 80,000 eggs in a single day; and Leuwenhoeck seems to compute 4,000,000 to the crab's share.

Many fishes produce an incredible number of eggs. More than 36,000 have been counted in a herring; 38,000 in a smelt; 1,000,000 in a sole; 1,130,000 in a roach; 3,000,000 in a sturgeon; 342,000 in a carp; 383,000 in a tench; 546,000 in a mackerel; 992,000 in a perch, and 1,357,000 in a flounder. But of all the fishes hitherto discovered, the cod seems to be the most prolific.

One naturalist computes that this fish produces more than 3,686,000 eggs, and another as many as 9,444,000. A rough calculation has shown that, were 1 per cent of the eggs of the salmon to result in full grown fish, and were they and their progeny to continue to increase in the same ratio, they would, in about sixty years, amount in bulk to many times the size of the earth. Nor is the salmon the most prolific of species. In a yellow perch weighing 3½ ounces have been counted 9,948 eggs, and in a smelt ten inches and a half in length, 25,141.

An interesting experiment was made in Sweden in 1761, by Charles F. Lund. He obtained from 50 female breams 3,100,000 young; from 100 female perch, 3,215,000 young; and from 100 female mullets, 4,000,000 young.

How Germany Proposes to Care for Her Laborers.

American employers of labor will feel some interest in examining the outlines of the gigantic system of insurance for workingmen just now put into operation by the German government. It is possible within the limits of such an article as this to present only the general features of the scheme, which is indeed so large that it is intended to include every individual in the empire who earns his bread by physical labor. Thus it is estimated that about twelve million persons will come within the scope of the act, the purpose of which is, first, to provide income for workmen disabled by accident or sickness, and, second, to assure a pension of greater or less dimensions to every worker who has reached the age of seventy years. The funds with which these obligations are to be met will come from three sources: from the government, from employers, and from the workingmen themselves. To this end the workingmen are divided into four classes, and the employers are required to deduct each week from the wages a sum which the employer doubles, from his own resources, laying aside the whole amount for the uses of the government bureau that is to administer the system. The four classes are divided according to the earnings of the members. In the first class are persons who earn $86 a year, in the second those that earn $140 a year, in the third those that earn $212 a year, and in the fourth those that earn more than $212 a year. For the first class the employer and the insured together pay in equal proportions say 3 cents a week, for the second say 5 cents a week, for the third 6 cents, and for the fourth 7½ cents. These payments have been fixed for the first ten years after the law goes into operation. They may be changed at the end of that period. The contribution of the state will be $10.50 yearly for every allowance. It is estimated that the state subsidy will amount to $1,600,000 the first year, and will increase until in the eightieth year it will reach $17,250,000, when it will gradually be withdrawn.

The beneficiaries, as we have said, include the whole population ordinarily classed as working people. Every man who becomes unable to work from any but criminal causes is entitled to relief, without regard to his age, if he has paid contributions for five years. The allowance in such cases ranges from about $26 a year in the lowest class to about $36 in the highest. To secure allowance for old age, contributions must have been made for 1,410 weeks, or thirty years of forty-seven weeks each. This diminution of the number of weeks in the year is made in behalf of persons who cannot find steady employment. The allowance for old age is, for the first class, about $26; for the second class, about $36; for the third class, about $41; and for the fourth class, about $46. The smallness of these sums will particularly impress American readers, but it is declared that the first named amount, $26, is, in fact, "equal to more than a third of the yearly average earnings of that wage class for which the allowance is granted." The object of the scheme is not to provide complete maintenance, but simply to help to that end. The cost of managing the vast and intricate business involved in this scheme is estimated at $3,000,000 a year. This sum, together with the amounts contributed by the state and by the employers, imposes a burden of taxation upon all others than the laboring class for the exclusive benefit of that class, and it is likely to prove in some cases oppressive.

The purpose of the rulers of Germany in putting the system into operation is manifold. In the first place, the pensions are a kind of compensation for the miserably low wages paid to German working people, and for this insufficient compensation the rulers of the empire are responsible. The maintenance of a vast and costly armament withdraws from productive industry half a million able-bodied men, and then it takes from the earnings of the laborers the sums required to pay for supporting the idlers. Less wealth is created than should be created, and part of that actually called into existence is squandered upon soldiery. The insurance scheme may be supposed to tend to reconcile the man who toils more completely to a system that thus robs and hurts him. The government, in fact, takes much from him and then returns enough to make him feel less fear of coming to want through sickness or the infirmity of old age. In the second place, the system no doubt was intended to have an influence in checking emigration, from which the empire has suffered so much. Low wages, heavy taxes, and compulsory military service have had the very natural effect to impel multitudes of persons to remove to lands where the conditions of life are less oppressive; and those who have been moved to emigrate of course include not only the most enterprising and progressive individuals, but those most desirable for military service. Between conscription and emigration the country loses every year the productive energy of many tens of thousands of persons, and this is simply an outright loss of wealth. The theory is that the pension scheme will tend to keep the discontented ones at home, by assuring them of maintenance, and by giving them a vested interest in the fund accumulated by their savings and the tax upon the empire and the employers. There is, of course, little reason to doubt that the theory is a sound one and that it will produce, in a measure, the anticipated results.

The dangers belonging to it lie, first, in the increase of the dependence of the people upon the government, and, second, in the giving of official sanction to the notion that the people who toil have a right to be supported by the other classes. The entire German system of government, however, rests upon the idea that the individual man ought to be ruled, and consequently ought to be coddled and cared for, by his superiors, and thus the insurance scheme is not likely to impress the popular mind as open to serious objection upon that account. There is far more peril to organized society in development of the notion that the property of one class is of a right also the property of another class, and that the laborer is entitled to demand from the capitalist whatever he may happen to want. Germany, in truth, is making a large venture in the direction of practical socialism, and the rest of the world will observe with deep interest what the outcome may be.—*The Manufacturer.*

Grakrut—a New Swedish Explosive.

A Swedish engineer, J. W. Skoglund, has invented a new explosive, which has been accepted for trials at the fleet. According to the official reports, the gray powder has been used with 25 millimeter as well as with Nordenfelt's machine guns. The former, with 70 per cent of the new powder against 100 per cent (or the usual charge) of ordinary powder, gives 33 per cent greater initial velocity, without the pressure in the gun being increased more than 5 per cent. With 62 per cent (ordinary charge weight) of gray powder, the initial velocity was increased 24 per cent without any perceptible increase in pressure. With a charge of 74 per cent (ordinary charge weight) the initial velocity was increased 40 per cent without the gun being subject to any undue pressure. With regard to the important question of smokelessness, the report states that while with Nordenfelt's machine guns smoke of ordinary powder remains for twenty-five seconds, the gray powder only leaves a transparent steam, which is only visible for five seconds.

Varnish for Cleaning and Preserving Harness and Other Leather Goods.

Four ounces of shellac, half an ounce of camphor, and one ounce of resin are dissolved in one pint of methylated spirit and shaken at intervals for 48 hours. The mixture is then colored according to the kind of leather with which it is to be used. Other resins, solvents, and proportions may be adopted.

Contract Work in the British Navy.

When a proposal is made for an extensive addition to the British Navy, the Admiralty are almost always confronted with the statement that the expenditure is a throwing away of public money. Now such an assertion is quite erroneous, and moreover is unworthy of being considered when the question of efficiency is at stake. Into the controversy as to whether an efficient army or navy is, or is not, an effective peace preserver, it is not our intention in the present article to enter—we have pronounced our opinion on the subject repeatedly; we desire rather to show that the money expended on our fleet of war ships, while it passes out of the treasury and is debited on the navy accounts, goes really to enrich the nation even monetarily, and, at the same time, by giving the assurance of safety and inspiring confidence in the possibilities of peace, it helps toward prosperity. In other words, the money is taken from the pocket of Peter to pay Paul, but since these two are partners of one firm, and their respective incomes contribute to the common profits of the copartnery, the result is satisfactory all round.

Taking the list of armored and unarmored ships in the British navy from Lord Brassey's "Annual" for 1888–89 as a fair basis of calculation, we have made a summation to show how much money has been paid to the leading ship building and marine engineering firms, throughout the country, for vessels built and for propelling machinery supplied for the Admiralty. Since the "Naval Annual" only includes effective ships, we have only dealt with these. Nor have we included ships at present building, or newly ordered, as in some such cases the prices are not given. We have also omitted ships bought by the Admiralty.

The result goes to show, to put it in a general way, that close upon 25 millions sterling ($125,000,000) has been paid direct to firms, the larger half to shipbuilders. We use the word "direct" to indicate that we have not in this sum included the millions of pounds sterling which have been paid to private concerns, on behalf of the several government dockyards, for steel and other metals, and machinery other than propelling, for ships built in these naval establishments. Probably if these sums were included, the total amount disbursed in the country would be nearer 30 than 25 millions (or $250,000,000). Almost every section of the community has profited directly or indirectly by this expenditure, so that the exact weight of the argument about throwing away money may be correctly compared with the undoubted advantages of being prepared in any emergency to maintain our supremacy, and with the beneficial results of effective armaments in preserving the peace of the world.—*Engineering.*

Vibration in Buildings.

One of the most perplexing problems that confronts the engineer is the vibration in buildings caused by running machinery. The character of the building, the ground on which it rests, the weight, power, and speed of engines, are all factors which must be considered, some of which are very indefinite, or at least their effect is hard to predetermine, combined with which is the very important influence which is involved in the relation which the speed of the engine bears to the natural time of vibration of the floor beams. It is evident that if the slight motion that every engine has is exactly in time with the natural vibration of the floor beam, each pulsation of the engine will increase the scope of the vibration of the floor, resulting in a most disastrous shaking, while if the pulsation of the engines are in discord with the floor, comparative quiet will obtain. As floor beams are usually long and their time of vibration correspondingly long, it is usually found that a fast-running engine will give less of its vibration to the floor beams than a slow-running one. It is also worthy of note that the vibrations of a fast-running engine are more numerous and less forcible, hence more easily resisted by the mass of the floor.

The Pittsburg *Dispatch* relates an interesting example of preventing vibrations by discord in the case of a 10 horse power engine, which on the upper story of a silverware manufactory created such a commotion as to rattle the silverware on the shelves a hundred feet distant. A change of twenty-five revolutions in the speed, which change was in the direction of increasing the speed, eptirely stopped the vibrations.

Peat Candles.

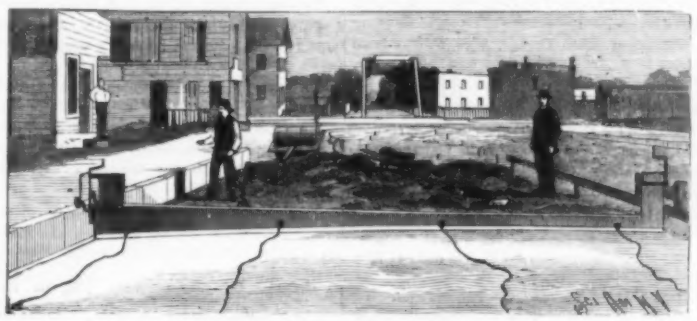
"Peat" candles are not made of peat, but of the paraffin that is distilled from peat in Brazil, where it is more plentiful even than in Ireland. According to the *Comercio des Amazonas*, John Grant & Co. are now having machinery installed at their works capable of producing 80 tons of peat paraffin a month. They are also extracting from the turf a valuable lubricating oil. They employ 300 workmen, and have 33 boilers, with purifiers, stills, and refrigerators in their plant.

How 33,000 Pounds was made a Horse Power.

When men begin first to become familiar with the methods of measuring mechanical power, they often speculate on where the breed of horses is to be found which can keep at work raising 33,000 pounds one foot per minute, or the equivalent, which is familiar to men accustomed to pile driving by horse power, of raising 330 pounds 100 feet per minute. Since 33,000 pounds raised one foot per minute is called one horse power, it is natural for people to think that the engineers who established that unit of measurement based it on the actual work performed by horses. But that was not the case. The horse power unit was established by James Watt about a century ago, and the figures were settled in a curious way. Watt, in his usual careful manner, proceeded to find out the average work which the horses of his district could perform, and he found that the raising of 22,000 pounds one foot per minute was about an actual horse power. At this time he was employed in the manufacture of engines, and had almost a monopoly of the engine-building trade. Customers were so hard to find that all kinds of artificial encouragements were considered necessary to induce power users to buy steam engines. As a method of encouraging business, Watt offered to sell engines reckoning 33,000 foot pounds to a horse power, or one-third more than the actual. And thus, says the *Manufacturers' Gazette*, what was intended as a temporary expedient to promote business has been the means of giving a false unit of a very important measurement to the world.

AN IMPROVED ROAD GRADER.

The accompanying illustration represents a road grader, patented by Mr. Henry J. Chambers, which is designed to facilitate the preparation of a road bed for the laying of a permanent pavement. A board has secured to its lower edge a metallic shoe, shaped to conform to the contour to be given to the road bed, and the ends of the board have upwardly extending posts or standards. The outer standard has brackets through which is passed a cranked adjusting screw, the lower end of the screw riding in a nut carried by a truck having two laterally extending arms upon which are mounted rollers. The inner standard also has brackets in which there is mounted a cranked adjusting screw, and the truck runs upon rails placed upon proper supports and carried at the center of the road bed in a line parallel with the curb. In operation a man is stationed to guide each truck, while other men grasp draught ropes and draw the apparatus over the bed of the road, whereby the desired contour is quickly and accurately obtained.



CHAMBERS' ROAD GRADER.

For further information relative to this invention address Mr. W. H. Duffett, Beatrice, Neb.

The Exhibition of the American Institute.

The American Institute Fair is now open in the American Institute Building on 3d Avenue, near 63d Street, in this city. While there can be no question that the Paris exposition operated as a counter-attraction, and caused the omission of many well-known names from the list of exhibitors, there is a most interesting and valuable display in the American Institute halls.

The machinery is driven by the Whitehill-Corliss engine, 250 h. p., built by the Newburg Steam Engine Works, the same engine that was in use last year. It is built on the most modern lines, the cylinder and slides being bored out, and the pillow blocks for the reception of the journal brasses being milled on the one centering. The engine works at about 75 revolutions to the minute, the driving belt working from the fly wheel.

Several ventilating fans are shown, driven by independent high-speed engines acting directly on the shaft. The wing fan is shown with two-cylinder engines, of course of very small dimensions, thus arranged. One fan has a three-cylinder engine of the general appearance of a Brotherhood engine to drive it.

Several gas engines are shown, the Otto and Crown engines among others. The Gas Engine and Power Co. of this city exhibit some elegantly finished naphtha launches, a type of boat that has acquired great popularity recently among yachtsmen.

The electric lighting of the building is done by Mather & Schuyler dynamos. The first named supply the incandescent light, and in themselves form a handsome exhibit. Their wooden bases and driving pulleys give them a characteristic appearance, and their smoothness of running is very noticeable.

The Diehl electric fan driven by a motor attached directly to its spindle is an interesting instance of the minor applications of electricity. The same motor is shown applied directly to the main shaft of a sewing machine. The field magnet is secured to the hub through which the shaft passes, and the armature is carried by the balance wheel. Thus everything is above the table, no band wheel is used, and the treadle is employed for starting and stopping only.

Among the wood-working machinery the W. H. Parry stair router, already illustrated in the columns of this paper, may be mentioned. It appears to be a very efficient machine, cutting out, by a rotating bit, the recesses for the treads and risers in staircases, as well as dovetailing the treads for the reception of balusters. Other work on panels, window sills, and jambs can be done by the same machine.

As an adjunct to the amateur's workshop the King vise cutting tool seemed very ingenious. It is a little shears that drops into an ordinary vise, and by which wire, small bolts, keys, and similar articles can be cut off. It is warranted to sever ¼ inch rod. Several exhibits of India rubber were of interest. Sphincter grip hose, of every size from ⅛ opening upward, made quite an impressive display.

White bronze was well shown in several monumental designs. The thickness of the castings and the method of uniting the pieces at the corners by a species of autogenous soldering make these monuments very durable. The sand blast finish applied removes from them any disagreeable metallic glare. The process of their manufacture has been very fully illustrated by us.

In sanitary appliances some objects of interest are shown. Tip-up sanitary appliances are exemplified in wash basins, ewers, etc. Soap-stone and ceramic wash tubs appear as rivals, while enamel paints are offered for use on bath tubs that are supposed to make the old look like new. The Aspinall enamels are shown in every color for use on wood, metal, glass, and earthenware.

In asbestos products a very fine exhibit is made by the Chalmers-Spence Company. Besides interesting specimens of the native mineral, the apparatus for and process of producing some typical products are shown. Recurring to the amateur mechanic, very neat asbestos soldering blocks, useful for brazing and general work involving small fusions, are exhibited.

Some very elegant photographic exhibits are to be seen. The Cramer dry plates and Eastman bromide paper are well exemplified among them. One bromide print of Trinity Church, Boston, is especially beautiful. For those who object to the dark room, the Anti-Dark Room Photographic Company show samples of what can be done by the addition of nuktigonia to the developer. Many examples of its use in the development of negatives in daylight are exhibited.

Food products occupy much space and are well worth inspection. The Cotton Seed Oil Product Company exhibit lard and salad oil made from cotton seed. They also show a number of kinds of soap, emphasizing our independence of Italy, Spain, and France in the matter of Castile soap and olive oil products generally. The Vanderveer & Holmes Biscuit Company have a bewildering variety of crackers mounted in a monumental structure. Sirocco tea marks the effort to substitute East Indian for Chinese and Japanese teas. Farinaceous foods are exhibited in many varieties.

The New York *Weekly* exhibits the Thorne typesetting and distributing machine at work upon their own publications. This very ingenious machine is worked by three men. One attends to the supply of type to the distributer, another works the keyboard for composing, and a third removes the type and justifies them. The three men do about the work of seven compositors.

A New Alloy.

This alloy consists of 87 parts of copper, 6½ parts of zinc, 4 parts of tin, 2 parts of arsenic, and ½ a part of phosphorus. The copper is melted in a crucible, the zinc, tin, and arsenic are then added, and just before the alloy is poured into the moulds, the phosphorus is added. This alloy the inventor states is not porous, it is ductile and elastic, it is not liable to tarnish, and it takes a good polish, it is capable of receiving electrolytic deposits of gold and silver, it is sonorous, and it is suitable for bearings for shafts. The rolling and drawing must be conducted slowly, and after each step in the operation the alloy must be annealed. It must not be brought in contact with water when hot, or it will crack. The inventor claims the alloy formed as described, and also some modifications in the proportions by which the properties may be altered.—*By F. Ellis, Harborne, Eng.*

RECENTLY PATENTED INVENTIONS.

Railway Appliances.

CAR COUPLING.—William M. Bunce, Sheldon, Mo. The drawhead in this coupling has horizontal spring-compressed coupling jaws provided with upwardly projecting operating levers, with other novel features, forming a device which operates automatically to couple the cars, and which may be operated to uncouple them without the operator going between the cars.

Mechanical.

FEED MECHANISM FOR BUTTON HOLE SEWING MACHINES.—Rudolph Spahn, Brooklyn, N. Y. This is a mechanism designed to insure a stitch of uniform length without regard to the machine being run fast or slow, without lost motion and with but little friction, while there are but few parts liable to get out of order, and the feed may be manipulated in any desired direction.

LATHE FOR METAL SCREWS.—John N. Severance, Readville, Mass. This invention covers an attachment for threading, reducing, and cutting wire, especially adapted to a machine capable of use in the manufacture of button shanks, by which the shanks may be expeditiously, accurately, and continuously constructed from a length of suitable wire.

Agricultural.

SEED DRILL AND FERTILIZER DISTRIBUTER.—Jonathan C. Peden, Rose, Mo. This invention covers an improvement in wheat drills, combined with which is a distributer to deliver fertilizer to the hoes with the cereal, the machine being so arranged that when the hoes are elevated from the ground the supply of seed and the fertilizer will be simultaneously cut off.

HAY RAKE AND STACKER.—Peter Heintz, Grand Island, Neb. The main frame of this machine has a vertically swinging lifting frame, on the forward end of which is journaled a rake, the machine being designed to gather the hay, carry it when gathered, and deposit the load at any desired point upon the ground or at an elevation above the ground.

Miscellaneous.

BELT SUPPORT.—Louis Sanders, Brooklyn, N. Y. This is a simple device of spring tongues with teeth and stop arm, etc., which may be made in an ornamental manner or so small as not to be at all conspicuous, for use in connection with tennis, yachting, or other shirts, to prevent the belt from riding up over the waistband of the trousers.

FENCE MACHINE.—Henry M. and Charles O. Tschopp, Pleasantville, Ohio. The object of this invention is to provide a simple, cheap and durable machine by means of which stretched strands of wire may be bound about pickets or palings, the invention covering various novel details and combinations of parts.

HORSESHOE.—Ernest A. Munger and John S. Rowell, Beaver Dam, Wis. This shoe is made in sections with elastic cushions between and rivets connecting the sections, making a shoe in which there will be a vertical yielding or spring, avoiding shocks or jar to the horse while traveling over hard pavements or roads.

CHAIN PROPELLER.—Nelson W. French, Tunkhannock, Pa. Combined with drive wheels on which travel endless chains, and fixed projections secured to the side of a boat, are blades pivotally secured to the chains, and automatically operated stops carried by the chains and holding the blades in operative position, the stops being adapted to engage fixed projections on the boat and be thereby released from contact with the blades.

GRAIN SCALES.—James H. Shelley, Brookiyn, N. Y. This invention covers a construction which provides for the utilization of the weight of the discharging grain to return a bucket-tripping attachment to a position such that it will act to trip the bucket-retaining attachment just prior to each discharge of the bucket.

FENCE MACHINE.—Emmet W. Channell, Waco, Texas. This is a machine of the class known as "fence looms," for making picket fences, the twister disks or tubes having extended hubs with radial notches, combined with a spool-holding frame detachably journaled at one end in the main frame, its opposite end having projections adapted to fit the radial notches in the disk, the machine requiring only the services of one man and a boy.

SAND REEL FOR DRILLING MACHINES.—William Richards, Mayburg, Pa. This invention is designed to provide a sand reel of simple and durable construction for use in connection with the sand pump of a drill adapted for drill wells, in which the pulley will be free from cleats, the shaft will be stronger than heretofore, and the gudgeons will be prevented from becoming loosened by the heat of the bearings.

MECHANICAL REPERTORY.—Joseph J. Fowler, Washington, Mo. This invention provides an instrument with symptoms printed on cloth in transverse lines, in connection with marks representing the names of drugs, designed to show what drug has disease-producing effects corresponding with the pathological symptoms of any given case, and which should therefore be the remedy according to the homeopathic law of cure.

TELEGRAPH KEY.—Eugene S. Crull, Mount Carmel, Ill. This is designed as a simple, compact key, adapted to work on roller bearings, thereby avoiding the rattle and sticking common to ordinary keys, and consists in a key lever provided with an annular bearing, the head or support having adjusting screws for supporting and adjusting the balls of the ball bearing of the key lever.

STAMP REGISTER.—Elton R. Henthorn, Buckner, Mo. This is a device especially adapted for use by fourth-class postmasters, whereby an accurate register may be kept of the various stamps of different denominations canceled, the invention covering novel details and combinations of parts whereby a cancellation will be registered simultaneously with the act of canceling.

MARKING PUNCH.—Vincent Bissig, Greenville, N. J. In this punch the stock carrying the marking wheel and locking lever catch is of solid construction, adapted to receive the blow of a hammer, and the catch is made to engage directly with the marking wheel, between its peripheral projections carrying the symbols, the wheel doing duty as a stamping wheel and a ratchet with extended leverage.

LETTER BOX.—William Cook, New York City. This box has a receiving and a stowage compartment, the compartments being separated at times by leaves moved to a position to constitute the bottom of the receiving compartment and the top of the stowage compartment, this movement being effected by a slide arranged in connection with a letter or package receiving opening

CONVEYER.—William R. Crow, Buffalo, Ill. This invention provides a conveyer by means of which heavy material, such as corn on the cob, grain, ores, etc., may be conveniently and efficiently elevated and delivered to a chute, the invention covering a novel and inexpensive construction and arrangement of parts.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(1490) J. P. T. writes: 1. What book do you recommend as a good cheap treatise on the treatment of different woods? A. The "Techno-Chemical Receipt Book" has valuable receipts on staining wood. We mail it for $2. 2. I deposited a check drawn by A. B. on the Commercial Bank in the bank upon which it was drawn. The teller received the check and gave me credit for it on my bank book. Some days afterward he (the teller) told me the check was not good, and asked for the amount of the check in cash. I contend that he should have told me that the check was not good when I deposited it. Am I right? Can the bank legally hold me reponsible for the amount of the check? A. Your term "some days" is indefinite. The bank has till the close of the business day to determine the validity of such a check left with it on deposit, and can thereafter only be charged with loss of the amount on proof that it did not exercise "due diligence" in notifying the depositor. 3. I have a lathe of 10 inch swing. The least number of threads that the lathe will cut to the inch (as indicated) is six. I want to cut spiral grooves in a wooden rod to make it represent a rope. Can the lathe be geared to do it, to cut say one thread to every two inches? If so, how? 3. Your lathe gear will not turn the spiral described. You are right in regard to time of ocean steamers.

(1491) L. A. K. asks for some information about using salt as a fertilizer on land and to draw moisture. A. Salt acts only indirectly, to dissolve matters already in the soil, in some cases being quite beneficial and in others a poison, according to what is in the soil to start with. It is sometimes used to check vegetation.

(1492) L. writes: What can be added to linseed oil or what is best to preserve and render waterproof the soles of shoes? A. Stockholm tar has been recommended, and is probably about the only thing having any value in this way. There is nothing really effective which does not practically change the nature of the leather.

(1493) P. J. W. asks for the best method of keeping apples during the winter say in 3 to 5 barrel lots. A. The secret of keeping apples is threefold. The apples must be of the proper kind. They must be hand-picked and absolutely free from bruises. They must have good ventilation. If in barrels, holes must be made in the sides or bottoms. The surest way to preserve them is to spread them on a grating out of contact with each other. One bad apple will start decay among the others.

(1494) G. S.—Mill picks, like other tools used for hard cutting, require more care in heating and hammering than in the manner of hardening or the fluid used. It is the overheating and burning of the corners in the dressing that does most of the mischief. A slow fire, careful hammering at a low red heat, and cutting off the fag edge, are essential to successful hardening, apart from the necessity of using good tool steel. A cherry red heat in a slow fire, and dipping vertically in plain water at shop temperature, should make the pick as hard as it can be made. If it is too hard, so as to break the edge upon trial, draw the temper to a dark straw color. A little practice should teach you the exact conditions.

(1495) J. C. K. asks for receipt for making extract of ginger. A. For extract of ginger proceed as follows: Take of ginger in No. 40 powder 50 ounces avoirdupois, alcohol enough to make 3 pints. Pack in a percolator, first moistening with 14 fluid ounces alcohol. Add enough alcohol to leave a stratum above the powder. When it begins to percolate close the lower orifice, cover the top of the percolator closely, and let it stand for 48 hours. Then open and allow to percolate until exhausted. Reserve the first 43 fluid ounces of the percolate. Evaporate the remainder to a soft paste, dissolve this in the reserved portion, and add enough alcohol to make the fluid extract measure 3 pints. The dose is from 10 to 20 minims. 2. The names of any works on the subject. A. The above is taken from the United States Dispensatory. Price $8. 2. Where can we get information on percolation and filtration? A. See above book, also, for this subject. 4. Also the cost of registering trade mark or copyrighting labels, etc. A. For label registration the cost is $16, for trade mark registration $45.

(1496) N. E. R. and others ask: If a round ounce ball be fired perpendicularly into the air, will it come back to earth with the same velocity that it left the gun? A. This question has been many times answered. The ball will not drop as quickly as it rises. It is sent up by one force—the explosive—against gravity and air friction. One of the latter, only, gravity, draws it down, and this also against air friction. In a vacuum the ascent and descent would be at same speed.

(1497) W. R. W.—The ether is supposed to transmit light. Its refraction is due to the reduction of velocity of ether waves in passing through some other medium. Therefore no refraction from transmission through ether is to be looked for. There are no conditions of any medium through which the sun's rays pass in reaching the moon that would show such refraction. Observation shows that the shadow line at the first and last quarter of the moon's age is at right angles to a line through the sun's and moon's centers. Any variation in its alignment is due to irregularities of the moon's surface or to the optical delusion of unequal reflection of the light along the edge of the shadow. Terrestrial atmospheric refraction has a slight effect in distorting the shadow line, entirely too small for casual observation.

(1498) E. A. McC.—The upper part of a room heated by a furnace is always hotter than the floor. The difference is not a uniform amount, but varies with the temperature outside, the colder weather making a greater difference between the floor and ceiling temperature. You may have 5, 10, or even 20 degrees difference between the floor and ceiling.

(1499) H. D. C. asks: 1. How can I compute the horse power of a water motor? A. It is not a simple thing to do. Use the Prony brake, or see tables and formulæ in Haswell's Engineer's Pocket Book, which we mail for $4. 2. B has an acre of level ground, and C has an acre of hilly ground. They both plant corn three feet apart. Now, by horizontal measurement has C any more room for corn than B? A. By horizontal measurement each has the same room.

(1500) F. O. F.—The indicated horse power of an engine is derived from the cards of pressure in the cylinder, while the actual horse power is the power transmitted, deducting the friction of the engine, and is measured by a dynamometer. Gasoline engines are coming into use. With proper care, the insurance need not be increased. The gasoline should be stored in a separate fireproof room, if possible in a separate building.

(1501) F. B. asks the heaviest shot or shell thrown by any artillery ordnance in the world. Also the largest amount of dynamite which has ever been thrown at once. A. About 2,100 pounds is the heaviest shot, using 900 pounds of powder; 300 pounds of dynamite has been fired a distance of about a mile from the pneumatic gun.

(1502) J. H. H.—Making a pulley of the fly wheel is common practice in modern engineering.

(1503) T. S. asks: 1. What is the pressure in foot pounds of water in an open stream with a current of say one mile per hour? A. 4·173 pounds. 2. What is the increased pressure in a current of two miles an hour? Is it fourfold? A. Fourfold. 3. Where can good treatises on the subject of currents be obtained, including tide currents? We recommend Haswell's Mechanic's and Engineer's Pocket Book, $4 by mail.

(1504) B. S. asks the power of a 10×12 engine, 2¼ inch feed pipe, with 70 pounds pressure, A. The power of your engine depends upon the speed, as well as the figures given. At 150 revolutions per minute it will have about 45 horse power. The cut-off has also much to do with a computation of its power. The mean pressure upon the piston as governed by the cut-off, multiplied by the area of the piston in square inches, and this product multiplied by the speed of the piston in feet per minute, and the last product divided by 33,000, gives the answer in indicated horse power.

(1505) F. A. M.—There is no reliable cure for warts. They generally leave of their own accord after a time. We have no special work on brass finishing. For brass coloring, bronzing, and lacquering, "The Techno-Chemical Receipt Book" contains valuable receipts and processes in all departments of industry. Price $2 mailed. "The Mechanic's Friend" is also a good book on general mechanical work, $1.50 mailed. You can make a good dip for brass by mixing equal parts strong nitric and sulphuric acids. Have the work perfectly clean by alkali wash, dip for a moment, and wash in clean hot water. Dry hot, and lacquer.

(1506) H. A. writes: 1. I have a yellow prune plum tree, and the fruit when half grown bleeds and forms a gum, the fruit then falling off. What causes this? A. The bleeding is probably caused by the sting of an insect. 2. Can you give me a receipt for making a good and cheap ebony stainer to use on poplar wood—something that will not rub off when varnishing? A. Boil 40 parts gall nuts, 4 parts logwood chips, 5 parts each sulphate iron and verdigris. Strain, and apply to wood. Then apply a coat of a solution of one part iron filings dissolved in 7 parts vinegar.

(1507) G. B. C.—The maximum safe velocity of cast iron fly wheels should not exceed a rim speed of 80 feet per second. See Haswell's "Engineer's Pocket Book," which we mail for $4, on fly wheels and centrifugal force.

(1508) H. J. F.—In using the heavier grades of kerosene or refined petroleum oils in lamps, the wick often becomes charred at the top, which obstructs the capillary action of the wick. When the wick is raised, the charred top obstructs the slot in the flame guard and diminishes the flame. Wicks should be often trimmed and renewed. The old wicks become hard and partially obstructed within the wick tube.

(1509) D. W. McC. asks the penetrating power of the most powerful cannon that has ever been constructed, and in what navy it is employed. A. A 135 ton gun lately made by Krupp for the Russian government perforated a 19½ inch steel plate with a steel shot, which passed through the plate and a thousand yards beyond it.

(1510) R. B. C. writes: 1. Can you give me formula for cement for fastening blades in ivory or horn handled knives? A. Melt together 1 part resin and 8 parts sulphur. When cool, pulverize it and mix with half its weight of iron filings, fine sand, or brick dust, and fill the cavity of the handle with the mixture. Heat the tang of the knife or fork and insert into the cavity and allow it to cool. 2. Also formula for making gelatine pad for hektograph copying. A. For hektograph see our SUPPLEMENT, No. 438, which we send for 10 cents.

(1511) C. S. writes: 1. Which of the following trades or professions is the best to learn, where the largest compensation is foremost in consideration for services rendered—civil engineering, surveying, architecture, wood engraving, draughting, or the different working branches of electricity? A. We should say that architecture and civil engineering of the branches named are the highest. The latter includes surveying and draughting, and with a little special study would include much of electrical engineering. 2. What are the special requirements a man would have to possess? A. A fondness for science, patience, good mathematical talent, and ability and willingness to work. 3. Also is it necessary in any of the above trades to have a perfect knowledge of the higher mathematics? A. If you treat them as professions, architecture and civil engineering without mathematics amount to very little. 4. What is Euclid? A. The word "Euclid" is often used as a name for geometry. Euclid was an author who wrote a treatise on geometry many centuries ago, and all modern geometers have followed closely in his footsteps.

(1512) J. P. — For storage battery see SCIENTIFIC AMERICAN, vol. lxi., No. 2, p. 22.

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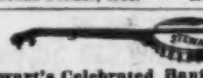

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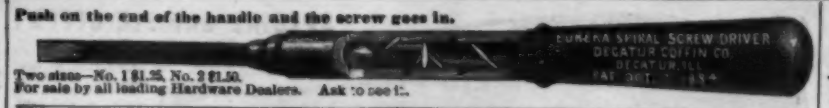

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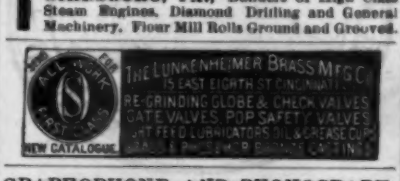

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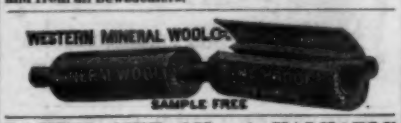

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